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ABSTRACT

To assist the Office of Technology Assessment of the U.S. Congress in identifying and resolving policy issues related to the electronic delivery of government services, this study examined selected innovative information technology applications, management practices, and policies that promote experimentation and integration with new electronic modes of government services delivery. Critical success factors for management and key policy areas for information resources management were identified. Findings and recommendations are based on a range of data collection techniques including focus group sessions, interviews, literature reviews, and policy analysis. Section 1 provides background and an overview of the study method. Section 2 assesses information technology to support electronic services delivery. Section 3 suggests changes to redesign information resources management in support of services delivery, and section 4 reviews successful state and local practices in electronic services delivery. The study concluded that the federal government must undertake a concerted, major effort to build a modern information and telecommunications technology infrastructure to serve its own internal information resources needs and to deliver services to its citizens. The federal government must work on a partnership basis with other levels of government, non-profit organizations, and private sector organizations in developing a national information infrastructure. Seven figures and two tables illustrate the discussion. Appendix A lists topics for further research. (Contains 230 references.) (SLD)

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ED 366 353

Federal Information Policy and Management for Electronic Services Delivery

For

U.S. Congress
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Washington, D.C. 20510

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EXECUTIVE SUMMARY

Today, technology exists to access government information directly from one's home, workplace, or business via modem, telephone, and computer networks. New modes of service delivery can be envisioned, and it is now possible for virtually everyone -- rural residents, senior citizens, business people, students, and the disabled -- to obtain government services delivered by these new technologies. But the Federal government, despite a proposed FY 1993 budget of $25.4 billion for information technology and with a large installed base of such technology, is only at the earliest stages of delivering government services electronically.

To assist the U.S. Congress, Office of Technology Assessment identify and resolve policy issues related to the electronic delivery of government services, this study had the objectives of:

- Identifying and describing selected innovative information technology applications, management practices and policies that promote experimentation with and integration of new electronic modes of Federal government services delivery
- Identifying and describing critical success factors for information resources management and key policy areas that affect the successful management of Federal information resources and delivery of services
- Recommending policy initiatives to improve the use of information technology in the provision of government services.

The findings and recommendations are based on a range of data collection techniques including focus group sessions, interviews, literature review, and policy analysis. Section I of the report provides background and an overview of the study method; Section II assesses information technology to support electronic services delivery; Section III suggests changes to redesign Information Resources Management in support of services delivery; and Section IV reviews successful state and local practices in electronic services delivery.

The study concluded that the Federal government must undertake a concerted, major effort to build a modern information and telecommunication technology infrastructure to serve its own internal information resources management needs and, more importantly, to deliver services to its citizens. The Federal government must also implement a management and policy framework that guides and directs a re-invigorated, customer-based service orientation. Finally, the Federal government must be involved, on a partnership basis with other levels of government and non-profits and private sector organizations in the development of a national information infrastructure. Guiding these initiatives should be a clear and strategic vision for delivering government services in an electronically-oriented information society:

> *The Federal government, in order to deliver its services to the citizens of the United States, provides quality services using electronic delivery mechanisms; deploys a modern information technology infrastructure that serves as the foundation for services provision; participates in and contributes to a national information infrastructure that provides ubiquitous connectivity for all citizens, re-orients Federal agency management practices to adopt a responsive customer-service attitude in the provision of quality services to citizens; promotes experimentation and risk taking; and rewards excellence in service delivery and innovative managerial and technological applications. This vision enhances government's provision of electronic services, increases government's productivity and efficiency, and promotes the public's general welfare and quality of life. To accomplish this vision, the federal government implements a dynamic*

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PREFACE

The implications of this report are of considerable magnitude, and the research team is aware of their significance to the better functioning of the Federal government, as well as their potential benefits for citizens. Many of the recommendations advanced here require substantial changes in the thinking of and organizational approaches to the delivery of electronic services. Some undoubtedly will argue that certain changes are too drastic, maybe even revolutionary. These changes, however, are necessary if the service capabilities of newer information and telecommunication technologies are to be fully utilized by the Federal government in its service to citizens and for its own internal information management functions. The vision proposed here to enable these changes is essential if electronic services delivery is to become a government-wide way of doing business.

From the outset of this research, the study team recognized that there would be no simple answers to the questions we addressed. Given the complexity and size of the Federal government, the differing organizational cultures from one agency to another, and a myriad of other interrelated factors, the study team hoped to gain through its various data collection activities a variety of perspectives, issues, problems, successes and failures, and, most generally, better insight.

But it should be recognized that the work undertaken here was completed in a time frame of a little less than four months, from August to December 1992. Moreover, because of the complexity of the work, many research questions and policy issues could have been analyzed in more detail and with greater depth. The more answers we received to our questions, the more follow-up issues and questions were raised; due to time constraints, some of those questions will require additional attention. Despite these limitations, the study team has outlined one approach for understanding, and moving more effectively into, the electronic services environment.

Our vision proposes that the Federal government must undertake a concerted, major effort to build a national electronic information infrastructure to serve its own internal needs and to reach its citizens. Without a national information infrastructure the Federal government will be relegated to a second-class organization operating merely at the periphery of the U. S. society in the twenty-first century. It is imperative that the Federal government plans strategically *now* for its role as a services provider in the development of the national information infrastructure.

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I. INTRODUCTION

A young woman in a small Iowa town pushes her grocery cart through the checkout line. After the clerk has totaled her purchases, the woman hands the clerk a small card that has been encoded with her monthly food stamp benefits. The clerk passes the card through a reader. The eligible foodstuffs in her grocery cart are deducted from the food stamps amount; the amount on the card is updated; and the store's reimbursement amount is automatically tallied. Electronic benefits transfer has facilitated the young woman's use of her food stamp benefits, eased the store's burden in participating in the program, and improved the Federal agency's ability to provide service as well as control fraud in the food stamps program.

A senior information resources manager in a Federal agency initiates an agency-wide process of installing local area networks (LANs) in agency field offices and connects the LANs with each other and the agency's central office using a wide area network (WAN). This process enables immediate access to agency data and provides electronic mail communications among and between the widely dispersed offices. Standardized productivity software packages are adopted by all offices, ensuring compatibility and resource sharing. In addition, through its connection to the Internet/NREN, agency program information is now accessible to citizens and organizations via this national computer network. The information resources manager understands that this information infrastructure must serve the agency's programs and mission, and that it is essential for the electronic delivery of the agency's services: "It adds value by benefitting the agency staff and ultimately in delivering services to the citizen."

ELECTRONIC SERVICE DELIVERY

American citizens are surrounded by an increasing array of technologies that are changing the way we work, shop, communicate, do business, and spend our leisure time. We have grown accustomed to automatic teller machines (ATMs), cable and interactive television, computer networks, touch screens, and a variety of technologies too numerous to list that not only process electronic information but also to deliver services. We have grown accustomed not only to these technologies but to the services, the responsiveness, and the flexibility enabled by them. For example, personal banking can be done on a 24-hour basis with ATMs; organizations provide toll-free 800 numbers for customer services. We become impatient with slow and ineffective services, with organizations that lack a customer-centered service attitude. Many private and public sector organizations have emerged or have been re-invented that envision information technology (IT), combined with a renewed commitment to serving their clients and customers, as fundamental to their continued existence. Should not citizens expect their government, whether at the Federal, state, county, or local level, to adopt a responsive customer-centered service attitude and deploy modern telecommunications and information technology in the provision of government services?

Today, technology exists to access government information directly from one's home or business via modem, telephone, and computer networks. New modes of service delivery can be envisioned, and it is now possible for virtually anyone – rural residents, senior citizens, business people, students, and the disabled – to participate in government services enabled by the new technologies.

Currently, the Federal government is providing electronic services inadequately, given today's technical possibilities. The Federal government, with its large installed base of IT, is at the earliest stages of using this technology to deliver government services in new and innovative ways. The Federal government is the largest user of telecommunication and computing technology, not only within the United States, but worldwide. It is also the world's largest creator, collector, user, and disseminator of information. A recent Federal study (Office of Management and Budget, 1992b) shows that IT expenditures by Federal agencies have more than doubled during the past decade, accounting for $22.1 billion in fiscal year 1991. Yet the Federal government lacks a clear and strategic vision for delivering government services in an electronic information society.

For too long, the automatic data processing (ADP) equipment and IT acquisitions by Federal agencies have served primarily internal functions -- processing information essential to the agencies' operations. Information resources management (IRM) emerged in the 1980s as the organizing framework for the entire range of management practices involved with agency information. ADP and IRM have, with few exceptions, been focused inward. Agencies have paid little attention to how this exciting new technology can actually be used in the delivery of government programs and services in a more effective and timely manner.

In times of shrinking budgets accompanied by increased demands on the government to provide programs and services, each Federal agency must have a commitment to a strategic mission, aligned with innovative and appropriate use of information and telecommunication technologies, to deliver services. However, as the history of automation clearly shows, the technology should not be introduced to deliver existing programs and services that are faulty; IT should not be used to do the same old thing faster. Instead, IT should enable a re-orientation to a service attitude and a fundamental re-thinking of what it is that agencies are doing. By defining new roles and responsibilities of agencies and using IT in all its varieties as an enabler, the Federal government can begin to move IT out from its focus on internal processes to supporting the programs and people who are delivering and receiving the services.

Various information technologies may help to reduce the need for ever-growing bureaucracies and can help bring government services closer to the nation's citizens. The efficiency of government services might be improved through the use of new information, and telecommunication technologies. The management of Federal information, the procurement and deployment of IT, and the development of appropriate policy to direct the management process and the delivery of electronic services are three critical concerns for both the Federal government and the public.

Harnessing this electronic IT for improved delivery of government services requires a recognition of the following imperatives:

- Federal agencies must adopt management practices that encourage innovation in the use of information and telecommunications technologies, provide incentives for innovation, and develop a citizen-driven service mentality among agency staff and programs.
- The Federal government must address the critical need for a modern information infrastructure within and among Federal agencies upon which the delivery of services and programs can be built.
- The Federal government must envision a government-wide, interagency strategy for the acquisition and deployment of information and telecommunication technologies.
- A Federal information policy system must guide and direct electronic provision of services.
- The Federal government must develop a vision for the creation and shaping of a national information infrastructure that can be used, in part, to deliver government services.

- Services and service delivery must be integrated among agencies, between levels of government, and with the non-government sector through partnership and collaboration.

The Federal government lags behind the private sector and other levels of government in using information and telecommunication technology to deliver services; thus, there is a need for deliberate change in strategy and policy direction in the Federal government. A governmental intiative (as discussed in Section VI) will be necessary if the Federal government is to move successfully into electronic services provision.

FOCUS OF THIS STUDY

The organizing question for this study is:

What information technologies, management practices, and policies enable the Federal government to better deliver services electronically?

The Office of Technology Assessment (OTA) Work Statement of July 29, 1992 outlined the specific areas to be covered by the research team: "Federal policy and management relevant to electronic service delivery, including implications for the organization and operation of the Federal government and the policies and plans that influence the use of telecommunication and computer technologies for service delivery."

The study team's principal objectives were: 1) to identify and describe selected innovative IT applications, management practices, and policies, wherever they might be found, that promote experimentation with and integration of new electronic modes of delivery of Federal government services; 2) to identify and describe critical success factors for IRM and key policy areas that affect the successful management of Federal information resources and delivery of services; and 3) to recommend policy initiatives to improve the use of IT in the provision of government services.

Accomplishing these objectives will assist Federal policymakers in the design and implementation of management and policy frameworks to improve the government's capacity to flexibly deliver services to all its citizens. Better and more efficient government services will be achieved by policymakers addressing the challenges of costly IT today and the opportunities of a responsive, systematically planned, government-wide information infrastructure of tomorrow.

The report is organized into the following sections, each of which contributes to the achievement of the study's objectives:

- Section II: Information Technology in Support of Service Delivery. Identifies key innovative technologies that are re-shaping our understanding of what is possible in electronic delivery of services. This section serves as a wellspring of ideas for the following two sections.

- Section III: Redesigning Information Resources Management for Electronic Services Delivery. Suggests critical success factors that must be addressed if IRM is to play a central role in the provision of improved government services.

- Section IV: Successful State and Local Practices in Electronic Services Delivery. Describes state and local government models for electronic delivery of services that Federal government service providers might emulate.

- Section V: Policy Issues. Identifies and discusses key policy issues the Federal government needs to address to move to the next level of quality in government services provision.

- Section VI: Recommendations. Presents a vision of electronic services provision by the Federal government and recommends a multifaceted dynamic initiative to realize this vision.

After the literature review and preliminary interview phase of this study, the team derived several conclusions and operating assumptions, including:

- The next major improvement in Federal government service provision will be the conversion to electronic delivery of present and future services, in whole or in part.

- The key to successful electronic service delivery is the use of innovative information technologies, management practices, and policies.

- Partnership and collaboration among Federal agencies, between levels of government, and with the non-profit and for-profit private sector is essential for effective service delivery and improvements in efficiencies in government operations.

- The private sector, as well as state and local governments, might have useful experiences to inform Federal government decisionmakers.

- There is a need for changes in policy to accelerate use of IT for electronic delivery of services.

In answering the focal question for this study, "What information technologies, management practices, and policies enable the Federal government to better deliver services electronically?" the study team uncovered a wide range of issues and concerns that will need to be addressed. The balance of this introductory section describes, in a preliminary fashion, a selection of the key considerations.

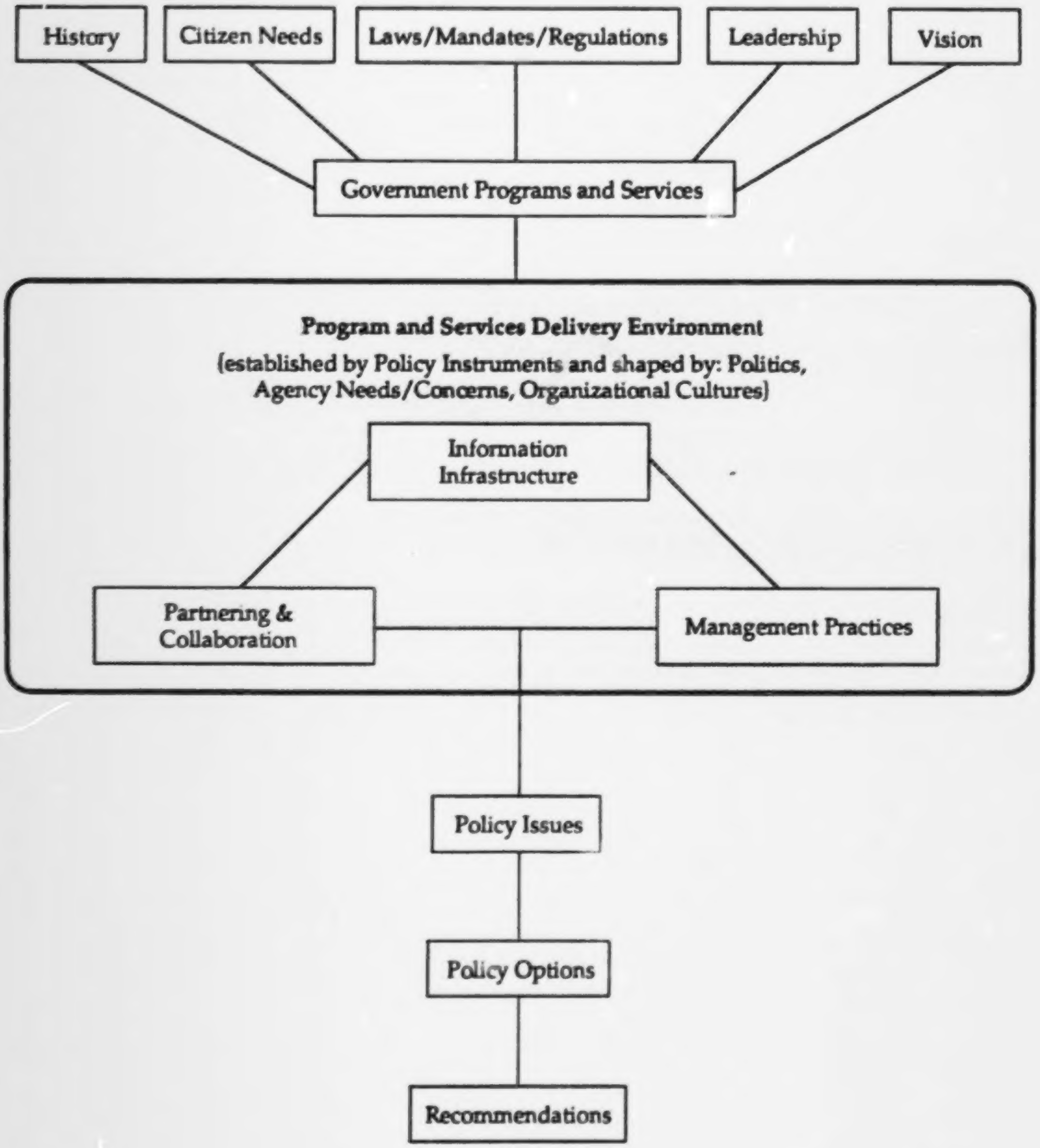
KEY CONSIDERATIONS

The study team developed the analytical framework presented in Figure 1 to guide the analysis of factors that affect the electronic delivery of government services. This framework also provides the organizational framework for the report. Five sections of the report discuss important broad areas of the framework: information infrastructure, management practices, partnering and collaboration, policy issues, and recommendations.

The study team found a number of discrete but often connected and interacting forces driving the development and existence of government programs and services. For example, the needs of citizens can result in specific legislation requiring the creation of a particular program, or the vision of an agency director drives the creation of a new service for the agency's constituents. An additional element, the political ideology and political context of the stakeholders, exists within the various elements and helps to shape the programs and services. For example, the ideology or political context of the Leadership will shape the Laws/Mandates/Regulations and in turn affect the type and quantity of services and programs, and how they are delivered.

Programs and services exist within a complex environment that guides and directs their delivery and realization. Politics, agency needs and concerns, organizational cultures, and policy instruments shape this environment. Of particular concern for this study is the identification and description of

Figure 1
Analytical Framework for the Electronic Delivery of Government Services


History
Citizen Needs
Laws/Mandates/Regulations
Leadership
Vision
Government Programs and Services
Program and Services Delivery Environment
(established by Policy Instruments and shaped by: Politics, Agency Needs/Concerns, Organizational Cultures)
Information Infrastructure
Partnering & Collaboration
Management Practices
Policy Issues
Policy Options
Recommendations

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information infrastructure, management practices, and partnering and collaboration, which the study team believes are essential elements for delivering services. These elements must be understood within the program and services delivery environment.

From the top line of the analytical framework through the program and services delivery environment, these elements inform the policy issues. An issue is defined here as a topic or possible decision area where there is conflict among different stakeholders. Generally, the issues will need to be resolved -- or at least addressed -- before a policy decision can be made. After the policy issues have been identified and assessed, the report offers a variety of options and recommendations upon which policymakers can act.

The following sections highlight a number of key considerations from this analytical framework when examining the electronic provision of government services. This background provides the broader context for the findings, conclusions, and recommendations of the study. These considerations weave through the major sections of the report, and what follows is an introduction to these considerations.

The Range of Government Programs and Services

Government programs and services encompass a broad range and a variety of types, and no single directive to agencies about delivering these electronically is likely to be effective. Correspondingly, a series of uncoordinated directives from disparate authorities will be equally ineffective. Some services may be suitable for electronic delivery while others may not. In determining the feasibility of delivering services electronically, it will be necessary to analyze various government services to see if electronic delivery, in whole or in part, is appropriate. One approach is to establish broad categories or areas of services. For example, one category might be services related to Environmental Affairs. In these broad areas, a number of stakeholder agencies will exist. In the category Environmental Affairs, stakeholder agencies might include the Department of Agriculture, Environmental Protection Agency (EPA), and others. In some cases, specific services may be the responsibility of more than one agency. An inventory of the entire range of specific government services can provide the basis for a useful classification or typology of services.

Within each general category of services, various types of services will exist. In the area of "Environmental Affairs," there may be "regulatory services," such as EPA rules on toxic materials disposal, and also "application services," such as applying to EPA for a permit to dispose of toxic materials. This level of granularity may help the analysis to determine if electronic delivery mechanisms are appropriate. In addition, specific types of electronic delivery mechanisms may be most effective to deliver certain services, e.g., a network-based database for regulatory information or a combination of electronic bulletin board and fax technologies for permit application.

It is necessary to provide additional guidelines for helping agencies decide what IT, if any, is most appropriate to deliver a particular service. The following are some criteria to be considered:

- Who are the users, with special attention to issues of access to technology, literacy levels, need for intermediaries, etc.
- What exactly is the service and its expected outcome?
- Can cost/benefit analysis, including alternative ways of delivering the service and their costs/benefits, assist in the development and evaluation of the services?

- What performance and outcome measures and evaluations can be used to measure the success/failure of the service and this use of IT?

- What agency resources, taking into account what resources does or will the agency need, such as funding, staff skills, etc., would be necessary to provide the service electronically?

- What partnering or collaboration is needed to provide the service?

The following is an example of a typology of services, giving the type of service, an example of the service, and potentially appropriate technology to deliver the service:

- Application process services -- SBA grant application (technology: kiosk, fax, etc.)

- Benefit transfer services -- Food stamps (technology: smartcard)

- Communication services -- Ombudsperson (technology: electronic mail)

- Goods-producing services -- (Government produces actual tangible goods -- may not be suitable for electronic delivery)

- Identification services -- Program availability (technology: network-based locator, e.g., via the Internet/NREN)

- Information services -- Economic statistics (technology: bulletin board system)

- Regulatory services -- Health and safety regulations (technology: network-based database)

An analysis methodology is important to determine the feasibility of delivering services electronically. If electronic delivery is appropriate for an identified service, there is still the question of who should be assigned the responsibility for delivering the service.

A Conceptual Approach for Describing Government Services Provision

Government services have their basis in legislation (stimulated by the real or perceived citizen needs), enabling policy statements, public demand, agency interpretation and initiatives, and historical activities. The services may be based broadly on the mission of the agency or derived from specific program activities. One assumes, however, that government services and programs are executed because they serve the public interest, i.e., the range of services and goods are offered for consumption for the overall benefit of the public. While there are important considerations related to "inherently governmental functions" (Office of Management and Budget, 1992d), the study team assumes that if the government is providing a service, program, or good, it is the government's function to provide that service, program, or good.

We described above the development of a typology of government services. Additional facets in a service typology might be: 1) responsibility for the service, 2) the funding mechanism to support the service delivery, and 3) the actual executor of service delivery.

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To determine who might be responsible for a service, it is necessary to see that each program or service of the Federal government includes four primary functions (Ross, 1988), each of which includes one or more roles:

Functions	**Roles**
Funding	Funder, investor, payer
Production	Producer, provider, administrator, distributor
Utilization	User, consumer, beneficiary
Control	Controller, regulator, coordinator, protector

One can assign responsibility for carrying out each of the functions. For example, in a given service the Federal government may be in the role of a "regulator," the state government may be in the role of a "funder," and a non-governmental agency may be in the role of a "provider." Moreover, the Federal government needs to acknowledge oversight and management responsibilities for these functions even if it is not assigned the responsibility for carrying out a specific one. In addition to who is responsible, there is also the issue of how the service will be supported:

Responsibility	**Support**
• Federal agency	• Public taxes
• Non-Federal govt. organizations	• User fees
• Private sector	• Subsidized by non-agency
• Agency/non-agency partnership	• Combination of types of support

Clearly, a range of approaches within this framework is possible for the provision of government services. The actual service provision of (1) what services, (2) by what delivery mechanisms, (2) by which agencies, and (4) with what kinds of support, also will be affected by a larger political ideology supported by the existing administration. For example, an administration's overall ideology may be based on pushing service provision into the private sector. For purposes of discussion, we identify the following basic politico-economic approaches that might drive the provision of services:

- Market-based
- Regulatory-based
- Social-welfare model
- Laissez-faire model

Each of these approaches offers a significantly different ideological context for determining responsibilities, delivery mechanisms, and support for provisions of electronic services.

Partnering and Collaboration

The Federal government is integrally linked to other levels of government, as well as the private sector, in the delivery of current services and programs. It is likely that more intergovernmental and private-sector collaboration and cooperation will be necessary to maximize the benefits of information and telecommunication technologies. Partnering is the process through which multiple parties unite to provide services. Policy guidance at the Federal level needs to address how partnering with other governmental entities and/or the private sector (both for-profit and non-profit, non-governmental organizations) can lead to more effective and efficient service delivery.

Within the Federal government, there is also a need for interagency (and possibly, intraagency) coordination and cooperation not only in the provision of services but also in the deployment of IT resources. Formalized channels among agencies to provide opportunities for sharing experiences and ideas are critical. The electronic provision of services has to be a cooperative effort crossing many organizational boundaries.

Information resources management and related IT efforts cannot be pursued by the Federal government in isolation, and opportunities for partnering and collaboration need to be explored. The Federal government can take the initiative in developing necessary partnerships for delivering services.

The Role of Information in the Electronic Delivery of Services

Fundamental to the delivery of any government service is information. Whether an agency is providing grants or loans, transferring payments or food stamps, promulgating health and safety regulations, disseminating government information, or conducting a host of other activities, the agency is in the business of collecting information about potential recipients, processing regulatory information, distributing program information to agency staff, and other information-related activities too numerous to list. "The Federal Government produces information resources, uses them and makes policy for their use, acts as a catalyst for their development, and *delivers services through them*" (OMB 1992a, p. III-5 [emphasis added]).

Because of the fundamental role of information in all government activities, and specifically in the provision of services, information management and IT must be examined for their contribution to the effective delivery of services. Information may be one of the "services" that the government provides, yet information is the basis on which all "services" are founded. In this report, there is no distinction made between "information services," "benefit services," or any other type of services. All are considered government services.

Information Resources Management

Given that the Federal government deals in huge amounts of information, much of which is essential for the provision of services, one of the primary foci when considering electronic delivery of services is the role played by IRM, the principal concept within the Federal government that addresses information flows. Since its origins in a 1974 Commission on Federal Paperwork, IRM has been an evolving concept, reflecting changes in IT, the needs of government, and a deepening understanding of the requirements for effectively managing government information resources. The 1986 Reauthorization of the original Paperwork Reduction Act (PRA) enabling legislation defined IRM as "the planning, budgeting, organizing, directing, training, promoting, controlling, and management activities associated with the burden, collection, creation, use, and dissemination of information by agencies, and includes the management of information and related resources such as the automatic data processing equipment."

The advent of new information technologies and our increased understanding of the information management process suggest that now an appropriate time to reconceptualize IRM to enable the improved delivery of government services. Without effectively managed information resources and the associated information infrastructure, the efficient delivery of government services cannot be sustained. A key consideration must be: What are the critical success factors that must be addressed if IRM is to play its part?

It is essential to see how the IRM functions can play a key role in the provision of services. The PRA ties IRM to agency programs and services delivery. In particular, "automatic data processing, telecommunications, and other information technologies are acquired and used by the Federal Government in a manner which *improves services delivery and program management*" (44 U.S.C. 3501 [emphasis added]). The internal focus of past IRM practice must now change. A redesign of IRM is both possible and necessary.

The Information Infrastructure

Harnessing the existing and potential benefits of electronic delivery media (such as CD-ROM [compact disk-read only memory], network technologies, hypertext, electronic benefits transfer, etc.) for effective government service delivery is, in part, the responsibility of IRM. This report outlines examples of innovative uses of IT in the delivery of government services (see Section II, "Information Technology in Support of Service Delivery"). While a particular IT can be implemented on a project basis, a broader view of IT in terms of an information infrastructure within the Federal government is needed. Such a modernized infrastructure may provide Federal agencies new flexibility and opportunities to innovate in service delivery.

The proposed revisions to Office of Management and Budget Circular A-130 (Office of Management and Budget, 1992c) define IT as "the hardware and software used in connection with government information, regardless of the technology involved, whether computers, telecommunications, micrographics, or others." This includes electronic or automated systems and machines to collect, disseminate, manage, analyze, present, store, exchange, manipulate data in textual, numeric, image, multimedia, or other formats. Advanced networking structures and integrated information systems increasingly characterize the environment of IT. In this new environment, proprietary systems give way to systems consisting of products from multiple vendors linked together in an open systems architecture. Government-wide standards such as the Federal Information Processing Standards (FIPS), as well as voluntary standards, provide interconnection, interoperability, and interchange formats for messages and signals. Standards are fundamental to successfully integrated systems and the deployment of an information infrastructure.

Levitan (1987, p. xvi) refers to information infrastructure as an underlying foundation and includes a range of components, including:

- People -- the information users and producers who direct, prioritize, interpret, and apply data and information to policy problems
- Documents, databases, and other information entities that hold information and data collections
- Information processes, such as collection, storage, retrieval, dissemination, communication, and display

- Information technologies -- the know-how for manipulating and accessing information, including the conceptual, statistical, and model-building structures that aggregate and process data and produce information content, as well as the mechanisms, people, and/or systems that provide intellectual, physical, and economic access to information.

Branscomb (1992, p. 17) defines information infrastructure as being "comprised of those facilities and services whose shared use by individuals and institutions, both public and private, enable more efficient and effective creation, adaptation and diffusion of useful information."

Some writers use the term "information technology infrastructure" instead of "information infrastructure" and mean something very similar. Weill (1992b) describes information technology infrastructure as consisting of two levels. There are the component hardware devices and telecommunications facilities. These are the base of the infrastructure. Above that is a "set of shared IT services such as universal file access, electronic data interchange (EDI) or a full service network" (p. 4). He argues that a "human IT infrastructure of knowledge, skills and experiences molds the two levels together into the firm's IT infrastructure" (p. 4). An information technology infrastructure can influence performance by "providing flexibility so that firms can handle a wider array of customer's needs without cost increases" and "provide a technological platform to enable other business systems to be produced" (p. 1).

This report uses the term "information infrastructure" and incorporates the broad meaning suggested by Levitan, Branscomb, and Weill. There are several organizational levels at which this infrastructure is deployed -- agency, government-wide, and nationally, and each larger level's infrastructure relies on the adequate infrastructure of its component parts. In this report, we address all three levels of information infrastructure.

An information infrastructure featuring a distributed, standards-based, open systems environment is not a one-time, one-project investment. The infrastructure is a long-term investment, centrally planned and executed to achieve economies of scale, which supports the programs of the agency. New applications and new services can be built upon the infrastructure. While the focus of this report is on the technology infrastructure, the Federal government also has a key role to play in the development of a national information infrastructure.

The 1991 High Performance Computing and Communications Program of the Office of Science and Technology Policy suggests that the National Research and Education Network (NREN) "will provide valuable experience necessary for the successful development of a broader, privately-operated national information infrastructure. Such an infrastructure would allow consumers, businesses, and schools and government at all levels to share quality information and entertainment when and where they want it at a reasonable cost" (Committee on Physical, Mathematical, and Engineering Sciences, 1991). In a recent report, the Office of Management and Budget (OMB) suggests that both public and private sectors "will participate in the creation of an improved, national, information infrastructure. But Federal officials have a special responsibility in that creation, given the roles and responsibilities of the Federal Government in the information arena" (Office of Management and Budget, 1992a, p. III-8)

Transformational Potential of Information Technology

Information technology can also have a transformational impact on agency activities, the organization and nature of the work performed, and delivery of services. IT is not just an additional or new input. It cannot be considered in isolation from the multiple effects it has on the work performed, the people doing the work, and the people who may be receiving the services delivered through the technology. If the technology is a means to reduce costs, streamline operations, or automate previously manual operations, or is used "to optimize one key aspect of the organization ... without making complementary changes in the behavioral system (the social/psychological environment or the culture)," it is "doomed to failure" (Chisholm, 1988, p. 39).

Automating previously manual activities within an agency can have the unintended, yet positive, consequence of "informating," which can affect the quality of the work and how productive activities and social relations of the organization are structured. "IT not only produces action but also produces a voice that symbolically renders events, objects, and processes so that they become visible, knowable, and shareable in a new way" (Zuboff, 1988, p. 9).

The introduction of IT may lead to new ways of providing services and information, enabling staff to participate and produce in new ways, and thus have a dramatic effect on how productivity gains will be manifest. "The 'informating' strategy attempts to capitalize on the greatly expanded amount and quality of information that computer-based systems make available and manipulable, so that employees can form more complex models of events within the organization, ask more sophisticated questions, and provide higher-quality answers to information requests" (Chisholm, 1988, p. 44). In fact, IT may enable agencies to provide new services not previously possible, or not yet conceived.

Agency managers, however, need to acknowledge that IT is not just a new tool that can be put to use, but a system of organizing work that can affect the health, motivation, and attitudes of the staff and result in a change in the quality of life in the workplace (Halachmi, 1991). The potential transformational impacts of information technologies in the provision of services are affected by the policy system that guide the use and implementation of information technologies. In short, simply because the IT is available, does not, in and of itself, mean that there is an appropriate policy framework that supports the management, use, and applications of that technology.

Improving the Effectiveness and Efficiency of Government

IT has the potential to affect positively the productivity of agencies in accomplishing their missions and, more specifically, in the delivery of services. Yet, an increase in productivity is not guaranteed simply by deploying IT. For example, choosing an inappropriate technology for a service may have an adverse impact on productivity; possibly the service was ineffective from the outset and technology will not improve its effectiveness; an improper application and management of a new technology can have negative effects on the staff; target recipients do not use the technology because it was not appropriate and so any efficiencies gained through the use of IT are lost through lack of use by intended recipients. There are any number of threats to positive outcomes in deploying IT.

Moreover, it is a common misconception that there is a causal linkage between IT and a value derived from that technology. Information technology never has a direct effect on value of the benefit derived from the technology. There is actually an intermediary step, i.e., IT impacts or enables a particular business process or some general organizational process. It is this process, assuming the IT is appropriately applied, from which a value or benefit can be derived. The focus then is on IT-enabled processes that, in turn, deliver value.

In service industries, it is not easy to measure productivity and productivity gains from IT. In fact, economists use the term "productivity paradox" to describe the non-appearance of productivity improvements after heavy investment in IT (see, for example, Brooke, 1992). While this may be a measurement problem, any policy recommendations that encourage the use of IT for delivering government services must caution against expectations that cost savings and efficiencies will automatically follow or be easily measurable.

We believe, however, there are positive benefits that accrue in terms of service delivery because of a modernized information infrastructure. Discussions will continue about the efficiency and effectiveness impacts of the technology on services, yet the Federal government cannot delay the modernization of its information infrastructure until cost efficiency of the new technologies are shown. There are several reasons for this. Like any infrastructure, such as highways, water systems, etc., benefit assessments are never easily accomplished. In the case of the interstate highway system, no one knew in advance what the payoff would be. Similarly with the information infrastructure, the payoff may not be known precisely because of the transformational nature of the technology, and not all the payoffs may be easily measured. Second, infrastructure is taken as a cost of doing business. We do not look at the telephones on agency staff member's desk from a cost efficiency perspective. Third, the nation's citizens are becoming increasingly familiar with the new technologies and come to expect the services that they enable. Responsiveness to the needs of its citizens may be part of the productivity equation the Federal government must use in justifying the modernization of its information infrastructure in support of service delivery.

A variety of models identify factors is involved in evaluating the productivity impacts of IT. Visions of productivity have been addressed in a variety of ways, emphasizing at times the efficiency aspect and at other times the outcomes of worker activity (Bouckaert, 1990). Evaluating the efficiency, effectiveness, and overall productivity impacts of IT will depend on the methodological approach employed.

Productivity analysis that compares inputs and outputs focuses on efficiency at the expense of effectiveness. Although outputs can sometimes serve as indicators of outcomes, outputs are not the same as outcomes. Effectiveness is concerned with measures of "the degree to which the intended purposes of the service were being met; the occurrences of unintended adverse impacts; the adequacy of the quality of the service provided relative to the community's needs, desires, and willingness to pay; the need and courtesy in responding to citizen requests; and the citizen perception of the satisfaction of the service" (Bouckaert, 1990, p. 77). By choosing to look at effects when analyzing productivity, one focuses less on the goods and services themselves and more on "their consequences for citizens, users, and taxpayers. Although output is indispensable, the focus is on results and consequences" (p. 77).

Given the different perspectives and methodologies for addressing the issue of productivity, Ayres and Kettinger (1983) provide one view that they believe is appropriate for assessing the effects of IT on government productivity. Although they base their analysis on an input/output model, they also recognize that "for meaningful assessments of the effect of IT on government productivity, however, quality must become an integral component of output" (p. 562). The measurement of productivity, never straightforward even at the level of "labor productivity," becomes more problematic when one adds an assessment of quality into the assessment of quantity. For Ayres and Kettinger, "productivity in government is the ratio of government output – services and occasionally goods – to governmental input – the total cost required to produce those services or goods" (pp. 562-563).

While introducing IT into the organization will likely increase operating expenditures, they conclude that "the great advantage of IT appears to lie in raising the level of service more than it raises overall costs. Indeed, IT can allow the provision of services that would be impossible without the equipment.... But to think of IT as providing 'savings' in this cases is misleading, because the level of service would never have been provided otherwise.... There is no assurance, however, that IT will lead to increased productivity" (Ayr and Kettinger, 1983, p. 565). While cautious about the capability for IT to increase productivity, Ayres and Kettinger see that the potential exists "for intelligently procured and sensitively introduced IT to increase productivity" (p. 565).

In short, policymakers must take care in linking provision of government services directly to increased productivity gains. New notions of "productivity gains" that incorporate societal benefits and agency effectiveness may be needed to successfully evaluate government services provision in an electronic environment. Recent legislative activity such as S. 20, "The Government Performance and Results Act of 1992," proposes performance-based evaluations for programs and would require agencies to look not simply at inputs and outputs but to more discerning evaluative measures for determining program effectiveness by "promoting a new focus on results, service quality, and customer satisfaction." Additionally, effective goal-oriented program management is essential. Evaluations of services also need to incorporate the effects of agency efficiency efforts on the recipients.

The productivity equation that focuses on short-term efficiency concerns of agencies at the expense of the increased efforts on the part of recipients merely shifts the costs away from the agencies and may not lead to overall productivity increases. IT offers the possibility of doing things in new ways and designing services not previously possible. Thus, we are dealing with a substantial change in processes and outcomes, and measurement of productivity changes in these situations will remain problematic at best.

Agency Activities and Organizational Culture

Applying IT to questionable practices and services, ones that may not be accomplishing their objectives, will not lead to services and practices that are effective. IT is a tool that can enable better service provision (Drucker, 1991). However, the tasks to which the tool is put need to be re-examined in light of goals, objectives, and functions of the agency. The question is: What is the task? The concept of business process redesign, "the analysis and design of work flows and processes within and between organizations" (Davenport & Short, 1990, p. 11) can assist a re-examination of what agency programs are trying to accomplish.

This concept is fundamental to the Corporate Information Management (CIM) initiative at the Department of Defense (Strassmann, 1992). Business process redesign examines how IT can support the business process, the "set of logically related tasks performed to achieve a defined business outcome" (Davenport & Short, 1990, p. 12), and investigates how the business processes, i.e., agency activities, themselves can be transformed using IT. Simply applying IT to existing practices will likely not produce any resounding changes in productivity or the effective delivery of services. Instead, the IT may increase the speed at which recipients get frustrated in already problematical services.

To improve the effective delivery of government services, a new attitude or cultural re-orientation is necessary within agency staff. For too long, citizens have complained of the lack of a positive service attitude -- a client-centered perspective -- by the Federal government. Utilizing new management practices such as total quality management (TQM) and other methods that highlight the need to serve the citizen, much as a private sector organization serves its customers, will have far-reaching effects on the perceived effectiveness of the government in delivering services. Such a change of culture, tied to a re-examination of what the agencies, their missions, and programs are attempting to accomplish, and with the application of appropriate information technologies in the delivery of services, can combine to provide the basis on which to build new levels of productivity by the government for the citizens it serves.

Finally, the organizational culture can serve to promote or inhibit innovation and risktaking by agency staff in the deployment of IT for electronic delivery of services. Environments that foster creative, innovative thinking and problem solving, and organizations that provide incentives and rewards for the effective service delivery, require forward-looking management practices whose goal is ultimately to provide better and more effective services to the citizens.

EXISTING FEDERAL INFORMATION POLICY CONTEXT

As noted previously, information is a critical element upon which government services are established. Thus, it is appropriate to look to Federal information policy instruments in understanding the policy context for the electronic delivery of government services. Several questions can be raised concerning whether the existing policy instruments provide the necessary guidance and direction for agencies in developing electronic delivery mechanisms. Can these policy instruments be more fully implemented? Is there a need for revisions to the existing policy? Are new policies needed? An analysis by OMB on agency implementation of policies for managing IT suggests that it is an "open question whether the problem [of agency management of IT] results from a lack of effective Government policy or the ineffectual application of available policy" (Office of Management and Budget, 1992a, p. III-30).

Figure 2 summarizes the instruments that serve as basic pillars for describing and defining the Federal information policy environment. But, there are a variety of other policy instruments or proposed legislation that bear on the acquisition, implementation, and use of IT in the delivery of government services. The following is a selection of other relevant instruments in specific areas.

- Procurement -- Federal Property and Administrative Services Act of 1949 (P.L. 152) and its amendments by the Brooks Act of 1965 (P.L. 89-306); Office of Management and Budget Circular A-11, "Preparation and Submission of Budget Estimates"

- Internet/NREN -- The Infrastructure and Technology Act of 1992 (S. 2937); Government Printing Office Wide Information Network for Data Online (WINDO) (H.R. 2772), which evolved into the Government Printing Office Electronic Information Access Act of 1992 (H.R. 5983)

- Technical Standards -- Office and Management Budget Circular A-119, "Federal Participation in the Development and Use of Voluntary Standards"; the Brooks Act of 1965 (P.L. 89-306); the Omnibus Trade and Competitiveness Act of 1988 (P.L. 100-418); Computer Security Act of 1987 (P.L. 100-235).

- Privacy and Security -- Computer Matching and Privacy Protection Act of 1988 (P.L. 100-503) and its amendments of 1990 (P.L 101-508); Electronic Communications Privacy Act of 1986 (P.L. 99-508); Right to Financial Privacy Act of 1978 (12 U.S.C. 3401); Computer Security Act of 1987 (P.L. 100-235).

- Records Management -- Federal Records Act of 1950 (P.L. 754) and its amendments.

These only begin to give a flavor of the range and type of instruments related to information policy.

Figure 2
Key Federal Information Policy Instruments

- "The Paperwork Reduction Act of 1980" (P.L. 96-511), as amended in 1986, (P.L. 99-500), Title VIII. The PRA is one of the most important policy instruments that affect overall management of government information. Its importance lies in (1) giving the Office of Management and Budget responsibility for the development and implementation of information policy, and (2) establishing IRM as a strategy to better manage Federal information and reduce the Federal paperwork burden.

- "Management of Federal Information Resources," Office of Management and Budget Circular A-130 (1985). This policy guidance is currently under revision, and a new version is expected to be published early in 1993. This sweeping policy instrument is especially important for its definitions of information-related terminology and its emphasis on utilizing private-sector sources in the management of Federal information.

- "U.S. Government Printing and Establishment of the Depository Library Program" (44 U.S.C. 19) Policy guidelines established within this instrument are largely outdated and prescribe printing and publishing activities for a non-electronic Federal environment. Recent efforts to update these guidelines have not been successful.

- "Freedom of Information Act" (5 U.S.C. 552). The FOIA provides a "safety net" that insures the public's access to certain types of government information. In recent years, there has been some concern expressed over the ability of the FOIA to be applied to government electronic information.

- "The Privacy Act of 1974" (P.L. 93-579; 5 U.S.C. 552a). The Privacy Act was the first and remains the most significant policy instrument protecting personal privacy in government records. It alllows individuals to insure "proper" use of government information of a personal or individual nature. These protections, however, are becoming increasingly difficult to interpret in an electronic environment.

- "The High Performance Computing Act of 1991" (P.L. 102-194). This instrument provides the primary policy guidance for the development of the Internet/NREN, including Section 101a which states that the Act shall "provide for improved dissemination of Federal agency data and electronic information."

- "Computer Security Act of 1987" (P.L. 100-235). In the interest of protecting "sensitive" information (defined as any unclassified information the loss, misuse, or unauthorized access or modification of which could affect the privacy protected by the Privacy Act of 1974), this Act requires agencies to identify systems containing sensitive information, establish security-training programs, and create a security plan for each system containing confidential data.

- "The Records Disposal Act" (44 U.S.C. 3301). This policy instrument provides for the National Archives and Records Administration to manage the life cycle of government information – including electronic information. Only recently, however, has the National Archives taken a proactive stance in "managing" the life cycle of government information; indeed, the task for the National Archives is daunting.

Overall, a reading of the information policy instruments listed above suggests the following:

- Information policy instruments are widely decentralized, oftentimes contradictory and ambiguous, and generally allow agencies plenty of room to operate "as they see fit."
- There are few enforcement mechanisms to ensure successfully that agencies will, in fact, follow designated policy instruments. Agency compliance with 44 U.S.C. 19, providing informational matter to the Depository Library Program, is a good example of this problem.
- Many of the central information policy instruments were developed prior to the electronic age, and the degree to which those instruments can be applied today, in a complex and converging information technological environment, is problematic.
- Despite a few statements, such as that previously quoted from the PRA, there is little direct linkage in the policy instruments between managing information resources and information technologies for *services to the public*.

A comprehensive analysis of key information policy instruments is needed regarding (1) authority and responsibility for managing information resources and technologies, (2) the degree to which IRM enables or inhibits electronic services delivery, and (3) identification of specific requirements for agency information management techniques to meet public services needs.

STUDY METHODOLOGY

The study's objective, as outlined by the OTA Work Statement of July 29, 1992, was to identify and describe innovative information technologies, management, and policies that enable better delivery of Federal government services. To achieve this objective, the study relied on multiple data collection and analysis strategies that addressed four principal research questions:

- What are innovative information technologies currently in use by Federal, state and local governments?
- What do these pockets of innovation and innovators suggest in terms of better information management practice at the Federal agency and government-wide levels?
- Is there a need to reconceptualize IRM, and if so, how?
- What do the innovations, innovators, and management practices require in terms of agency and government-wide policy issues and recommendations?

The study team's previous work in a related area (McClure, Ryan, & Moen, 1992b) suggested a robust study approach to elicit the range of innovative practices and policy recommendations required to meet OTA's charge. The present study's approach had several key characteristics that were drawn from the study team's earlier work, including:

- A qualitative research approach. Schwartz and Jacobs (1979) suggest that when a study's primary focus is on a behavior's meaning rather than on the frequency of its occurrence, a qualitative approach is more appropriate than a qualitative one.

- An evolutionary strategy. The exploratory nature of the study suggested the conscious design of data collection and analysis so as to inform subsequent data collection. The study team devised a model based on Glaser & Strauss's (1967) theoretical sampling approach. A single data collection activity frequently addressed multiple research question components.

- The use of standard research techniques. For example, the study team devised techniques for focus groups following Morgan (1988) and Krueger (1988), case studies concepts from Yin (1989), and interviews drew on approaches developed by Spradley (1979), Smith (1981), and Bradburn, Rips, and Shevell (1987).

- Close monitoring of the quality of the data. The study team incorporated techniques suggested by Campbell (1975) and Kirk & Miller (1986) to increase validity. The study team also employed outside readers with experience in the relevant policy areas to review the report and its findings.

The design of this study sought to capture the range of views and experiences Federal information technologists, managers, and policymakers have in improving the Federal government's delivery of services.

Data Collection Techniques

Figure 3 describes the study methodology and data collection approaches, which the study team performed during the four-month time frame allotted for this study. The study began with the OTA Work Statement and the formulation of preliminary research questions. The study team then began an extensive and ongoing literature review and conducted preliminary interviews and pre-tested data collection instruments. These activities led to the identification of key informants, sources of innovation worthy of further investigation, and a refined set of research question (see Appendix A). These events informed the study team's principal data gathering activity, a three-day visit to Washington, D.C., in October 1992 during which the following data collection activities took place:

- Focus group sessions with innovative Federal agency information policy and management leaders, Congressional staffers, and others knowledgeable about electronic services delivery by the government

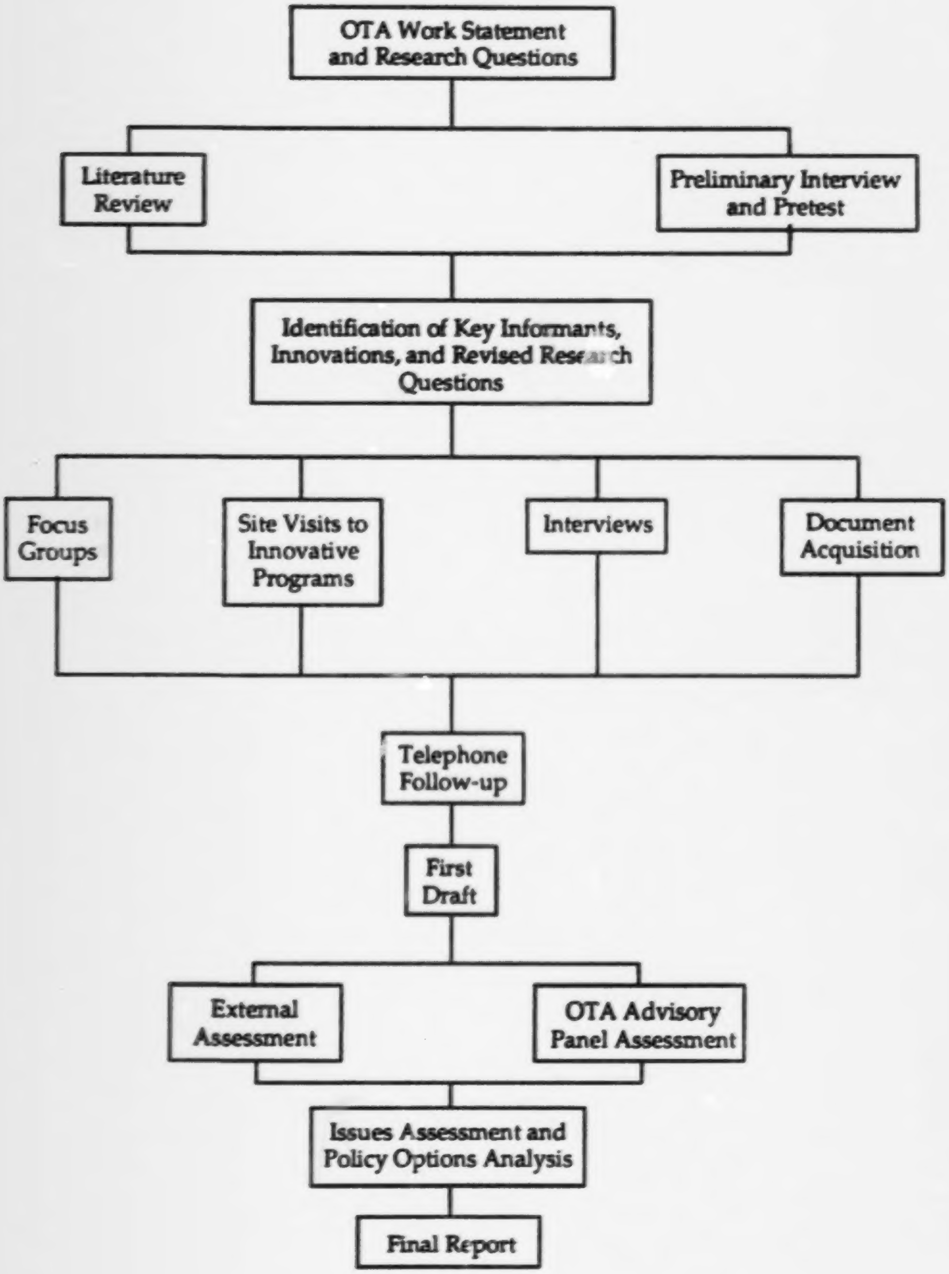
- On-site visits to Federal agencies with innovative information management techniques or innovative information policies

- Individual and group interviews with selected agency officials and/or representatives from other study populations.

- On-site document acquisition of relevant materials from our key informants.

The study team developed objectives, data collection instruments, and scripts for these data collection activities based on the pre-tested instruments. Subsequent follow-up interviews conducted by phone further enhanced data collection and confirmed findings.

Figure 3
Study Methodology


OTA Work Statement and Research Questions
Literature Review
Preliminary Interview and Pretest
Identification of Key Informants, Innovations, and Revised Research Questions
Focus Groups
Site Visits to Innovative Programs
Interviews
Document Acquisition
Telephone Follow-up
First Draft
External Assessment
OTA Advisory Panel Assessment
Issues Assessment and Policy Options Analysis
Final Report

These events led to the first draft of the report, which was reviewed and critiqued by external assessors and the OTA Advisory Panel. The external assessors were knowledgeable experts who reviewed the draft and offered suggestions and comments.

Following the first draft, the study team conducted an Issues Assessment and Policy Options Analysis, which resulted in the material presented in Section V. Recommendations, presented in Section VI, flowed from this assessment, the analysis, and the data collected.

The qualitative approach employed by the study team generated a rich array of empirical data from which to draw conclusions and make policy recommendations. The combination of steps outlined above contributed to increasing the credibility, reliability, and validity of the data as well as to the overall utility of the study findings and recommendations.

Study Population

The OTA July 29, 1992 Work Statement outlined a range of potential groups to be studied in this investigation. Clearly, all the appropriate study populations could not be investigated at a detailed level of analysis. Thus, the primary study populations for the investigation included:

- Federal government officials
- Users of government (primarily Federal) information services and products

Secondary study populations include:

- State and local government officials
- The private for-profit sector.

These groups are not necessarily mutually exclusive. The study team focused, however, on the views and assessments from Federal government officials and users of Federal information services and products.

During the data collection trip to Washington, D.C., the study team interviewed several high-ranking and experienced members of Federal Executive and Congressional agencies (n=34), national government associations (n=3), the private sector (n=2), and the academic community (n=3). In all, 42 people representing 21 organizational units participated in either focus group meetings or individual interviews. Follow-up phone interviews and correspondence throughout the study allowed for further exploration and clarification of topic areas, especially as new developments emerged in relevant research areas.

The primary audience for the report is the Office of Technology Assessment as the contracting agency. Another primary audience is the U.S. Congress, the Executive Branch, and Federal information managers and policymakers of both branches. A secondary audience for the report is individuals in the public, private and academic sectors knowledgeable about and interested in the future development of Federal information management and policy.

THE NEED FOR CHANGE

The development of an electronic environment in today's society has occurred more rapidly than the Federal government's ability to use and exploit the technologies that constitute that environment. Indeed, the range of technological applications for providing information and electronic services far outstrips government's managerial skills, organizational skills, and policy frameworks for managing the constantly changing and evolving electronic environment. At a time when increasing demands are being placed on governments to be more responsive to citizen needs, it is imperative that the Federal government better exploit electronic information services provision to more effectively and efficiently improve the success with which individuals and organizations interact with the government. The General Service Administration's Service to the Citizens initiative (McDonough & Buckholtz, 1992) is one example where the successful use of IT does serve citizens in several service areas.

While some pockets of innovation regarding Federal electronic services provision can be identified, there is much work to be done before the Federal government can effectively exploit IT to deliver services. By and large, the Federal government tends not to be "service-oriented," management strategies are not directed to identifying and meeting service needs of the public, the information infrastructures of a number of agencies are woefully out-of-date, and information technologies are oftentimes deployed primarily to meet internal agency needs. Indeed, many innovative uses of information technologies for governmental services provision are occurring in the state, county and local settings -- not at the Federal level.

For the Federal government to be an effective provider of electronic services, there must first be:

- A commitment and an accountability to serving the needs of the citizens of the nation
- Knowledgeable leadership that recognizes the importance and potential of information technologies for electronic services delivery
- A modern information infrastructure deployed throughout government in a coherent and standardized strategy
- A recognition of the importance of services, the need for the Federal government to provide high-quality services, and an ability to identify those services that best lend themselves to provision in an electronic environment
- Agency officials that know how to use the technology and have the opportunity and incentives to develop electronic services.

This study suggests that an important priority for the new administration will be the technological modernization of the Federal government -- in terms of both information technologies and the knowledge, skill, and attitudes of the government workforce. A dynamic Federal initiative should guide the modernization effort and include not only the deployment of an information infrastructure throughout government, but also the training and re-education of government officials to exploit this new infrastructure, the introduction of a service mentality in which government officials recognize the importance of meeting citizen needs, a reconceptualization of what information resources management means for government services provision in the 1990s, and incentives that encourage agencies to be innovative in exploiting information technologies for services provision. Such change is essential if we are to have an effective Federal government that meets the needs of its citizens as we move into the twenty-first century.

II. INFORMATION TECHNOLOGY IN SUPPORT OF SERVICE DELIVERY

INTRODUCTION

Information technology is the foundation upon which Federal agencies can develop a range of electronic services. More effective use of modern IT can also result in significant cost-savings for the Federal government. A principal finding of a recently completed General Accounting Office (GAO) study (1993) is that millions of dollars could be saved by agencies and the Government Printing Office in the preparation of the Federal Register if even one-third of the documents were submitted in electronic format with appropriate typesetting codes.

The pressure has been steadily increasing on public-sector organizations to lower their operating costs and to improve constituent services. At the same time, governments must reach all of their citizens cost-effectively, even in remote parts of the nation. Such demands are typically in direct conflict with each other, yet existing and emerging IT can help to accomplish both objectives. Voice and data telecommunication networks combining telephone company services and an agency's own information infrastructure allow the agency to link staff members at all facilities and give them access to the information they need to provide citizens with immediate and accurate assistance. Such networks can also connect agencies directly to the public, thus creating opportunities for the electronic delivery of government services.

Ideally, the IT used by any individual agency constitutes a component of a larger, government-wide information infrastructure. It is becoming essential that information infrastructures be "integrated systems," in which products manufactured and sold by different vendors can be linked together (Office of Technology Assessment, 1990). Standards that afford interconnection, interoperability, and interchangeability are fundamental to successful integrated systems and the deployment of an information infrastructure.

This section reviews a number of current innovative electronic service delivery programs that have been instituted variously at the Federal, state, county, or local level of government, briefly describing each initiative and exploring related key topics and issues. The experience gained by these programs contributes to an increasing knowledge base of ways to use IT for service delivery. Federal agencies that are developing new service delivery mechanisms may find these examples helpful. For policymakers, this section provides a glimpse at the realistic possibilities of electronic service delivery, once the Federal government adopts a vision and enacts the necessary public policies.

INFORMATION INFRASTRUCTURE

While individual Federal agencies can use information technologies to provide services for specific programs, a Federal information infrastructure requires the coordinated deployment of modern telecommunications and information technologies throughout the government. A government-wide information infrastructure will connect central agency offices with field offices and regional centers, providing the capability to easily share electronic information resources, enhancing staff communication, and enabling effective management of resources--all technical prerequisites to delivering services electronically. Equally important, however, the same abilities, with appropriate safeguards, will be established across agency lines and even between governmental levels. This government-wide information infrastructure, combined with existing computer, telecommunications, cable, and other networks, can extend the reach of government services to a large number of citizens.

The ideal information infrastructure will enable agencies to provide government services directly to the home. While that ideal is still years away, some of the components are already in place. Nearly every home in the country is connected to the public switched telephone network, mostly via copper wire. A growing majority of American homes are also connected to a coaxial cable network over which cable television programming is transmitted. Fiber-optic cable, with its unprecedented capacity, now carries much of the country's long-distance telephone traffic, and many believe that it will be routed "to the curb" within the next decade. Specifically which of these networks becomes part of the government's information infrastructure is a moot point. These and other telecommunications technologies are rapidly converging, and trying to differentiate among them will soon be meaningless (Kim, 1987). The important feature is that they provide two-way electronic access to the home.

With the passage of the High Performance Computing Act of 1991 (P.L. 102-194) and its authorization of the NREN, Congress has moved to put another component of the national information infrastructure into place. The NREN will provide high-speed connections between the nation's major research organizations and universities. Hope runs high that its connections will also extend to public libraries and other local community users.

While the NREN is still in its preliminary stages, many states have forged ahead and installed state-wide networks. In fact, Kurshan (cited in Kahn, 1992) found that approximately 60 percent of all states have state-wide networks in place, mostly connecting state university, college, and secondary education institutions. These networks provide several services, including access to databases, documents, and other information resources, as well as training and instruction. For example, SUNYNet, the State University of New York's computer network, connects 34 state-operated campuses with the University's central administration. SUNYNet permits the central administration to better maintain SUNY employee records, link university campuses for joint equipment procurement, integrate with the New York State's Higher Education Services Corporation, process financial aid applications, and connect with the New York State Department of Labor's campus placement offices, thus providing job referrals and labor pool information (Kahn, 1992).

Most state networks are already connected to the Internet, from which the NREN is expected to evolve. It will be up to the Federal government to encourage those states that are not a part of the developing national network to get connected. Thus, the Federal information infrastructure will be, in fact, a network of networks (Dertouzos, 1991), a maze of interconnected systems that will transcend traditional boundaries between user settings.

Once a national information infrastructure is in place, it will facilitate the electronic delivery of a host of government services. It will also enable Federal agencies to work with other levels of government to enhance services, coordinate programmatic initiatives, and reduce duplication of effort. Even now, without the support of such an infrastructure, individual advocates for innovation at different levels of government have made advances in offering government services electronically. Some examples of these pilot projects and full-scale programs are described in the following section.

INNOVATIVE USES OF TECHNOLOGY FOR SERVICE DELIVERY

The following sections highlight innovative uses of IT in the Federal government, with some additional examples from state, county, and local governments and from the private sector. A case study of one specific technology application, Federal bulletin board systems, follows these examples. Bulletin board technology, while neither new nor innovative, has a track record that illustrates what to do, what not to do, and what should have been done when implementing an IT for service delivery.

The chapter concludes with a discussion of the standards foundation essential for electronic service delivery, and organizational structures that exist for sharing information on the implementation and maintenance of information technologies.

Electronic Benefits Transfer as Service Enhancement

Electronic benefits transfer (EBT) systems have been studied and tested in several pilot projects for the past twelve years (Wood & Smith, 1991). In a paper-based environment, the necessity of producing checks incurs a labor-intensive expense in the disbursal of cash assistance. In addition, check cashing is often problematic for recipient populations. Approximately 39 percent of these recipients do not have bank accounts and must pay an average fee of 1.5 percent for check-cashing services, frequently at non-bank locations in urban areas. Programs such as food stamps disbursement have a high overhead for coupon production, delivery, and processing. The United States Department of Agriculture's (USDA's) Food and Nutrition Services (FNS), the Department of Health and Human Services's Family Support Administration (FSA), and the Treasury Department have each been testing the use of EBT.

New York City has offered a full-scale benefits transfer program for Aid to Families with Dependant Children (AFDC) benefits and food stamp recipients since 1986 (Wood & Smith, 1991). More than 400 attendant-operated benefits terminals disburse cash and food stamp coupons from locations in check-cashing centers and in some banks. Each benefits recipient is issued a card with a magnetic strip, photograph, and signature panel. Upon presentation of the card, the attendant at the terminal verifies the recipient's identification and disburses the benefits. The New York City Human Resources Administration reports an annual savings of $9 million.

Using the USDA's food stamps program as an example, there are currently two different methods for electronic benefit delivery: online and offline. A background paper issued by the Office of Technology Assessment (1988c) describes these methods in more detail.

Online

The predominant method, online utilizes a magnetic-strip card on which benefit information is stored. The benefit recipient goes to a participating store, purchases his or her goods, and passes the card through a point of sale (POS) terminal. A direct connection is then established with the EBT host system, which verifies benefit availability and approves or disapproves the current purchase of applicable items. The online system requires extensive telecommunications technology, incurs phone costs, and is subject to down-time.

Offline

FNS is currently testing two pilot projects involving the use of smartcards, one in Dayton, Ohio, for food stamp benefits, and the other in Casper, Wyoming, for Women, Infants, and Children (WIC) benefits. This technology involves the use of cards equipped with read-write microchips. Recipient benefits are encoded onto the chip at one of three stores capable of loading the correct benefit information. Recipients can shop at any participating store. EBT host computers download the recipient data to the local store's LAN, which transfers the information to the POS terminals. As items are purchased, data are encoded onto the card's chips and stored in the store's LAN. This information is subsequently uploaded to the EBT host. Smartcard technology utilizes batched data and does not incur large telecommunications costs. With this system, overdrafts are the burden of the states, rather than FNS. Unfortunately, there are no universally accepted smartcard standards.

EBT projects need the cooperation of the government and the private sector. Federal, state, and local governments, retailers, ATM network operators, and banks all have a stake in providing more efficient and cost-effective services to government benefits recipients. Coordinating the activities of these various providers may account for the long testing period for this technology, which has already spanned twelve years. The Federal government should be steering the state efforts to provide standardized service provision.

Fax as a Time-Sensitive Delivery Mechanism

Fax-on-demand systems are emerging in several Federal agencies to provide a method for delivering publicly available, time-sensitive information (Baerson, 1992b). The National Cancer Institute of the National Institutes of Health (NIH) has a free service called CancerFax, which is used by an average of 100 people per weekday to obtain up-to-date information concerning cancer treatment. The automatic NIH system immediately sends the caller a six-page document describing the diagnoses via fax; all have full fax reports available. The Commerce Department's Economic and Statistics Administration offers Electronic Bulletin Board and Fax (EBB/Fax), an electronic bulletin board service enabling users to obtain documents via fax on foreign trade and monetary data within hours of their release. The EBB/Fax service charges 65 cents a minute, billed to the caller through the 900 number used to reach this service.

The fax machine is now ubiquitous in American offices, schools, and libraries. The NIH and the Department of Commerce have based their choice on this technology's popularity, ubiquity, and conformity to standards. Fax services, and particularly the fee structure built into these services, should be noted by all Federal agencies that disseminate time-sensitive information to the public.

Kiosk Access to Enhance Agency Service Delivery

For the past several years, the banking industry has provided customers with the ability to perform their banking business at automatic teller machines (ATMs). These ATMs are minimally equipped with video terminals and keypads and are attached to an online networked database. Federal and state governments have borrowed this notion of 24-hour service provision by developing similar terminals, frequently adding touchscreens and sound. These machines are called information kiosks. Online kiosks have a network connection to an existing government database, while offline kiosks are self-contained units in which information is stored within the kiosk itself.

Info California, a kiosk pilot program operated by California's state government (Hanson, 1992), provides a single access point for city, county, special district, state, and Federal government information. Fifteen kiosks offer touchscreens and bilingual menus to government services. Transactional applications available through the menus include renewing a driver's license, taking a driving exam, ordering a birth certificate, and payin traffic fines. The kiosks also provide information in the areas of Education, Employment, Environment and Resources, Family and Children, General Assistance, Health, Legal, Business, and Transportation/Vehicles. The system was even used to coordinate the volunteer efforts for cleanup after the Los Angeles riots. The pilot project has been completed and a Request For Proposal has been issued for 100 more kiosks. Results of the pilot project indicated that 58 percent of the kiosks' use occurred outside of business hours, and the Spanish-language menu was selected 17 percent of the time. The state imposes a surcharge on transactions made at the kiosks, payable through credit cards. The 100 new kiosks will test the revenue-generating or cost-recovery potential of government kiosks.

The Department of Veterans Affairs (VA) is testing the potential of kiosk services at the Federal level. The first kiosks are scheduled to open in January of 1993, as a cooperative venture between the VA and the Charles County (Maryland) government. The pilot program kiosks will provide information services for home loans, health care, and education benefits. The kiosks will print applications, but will not handle transactions (interactive services), although that capability may be added in the future. The VA is also pursuing partnerships with other Federal agencies, state governments, and county governments, to provide multiple services at each kiosk.

The use of kiosks for service delivery has the potential to add to both the quantity and the quality of government services, with the additional ability to recoup costs or generate revenue if necessary. The kiosk is one of the more promising technologies for the electronic delivery of government services. Unless there is some interagency coordination and cooperation, however, the Federal government is in danger of creating a system in which a citizen must use several terminals in different geographic locations, with different interfaces, to obtain different information or to perform different types of transactions.

CD-ROM Uses

CD-ROM (Compact Disc--Read Only Memory) technology is based on the CD-ROM disc, an optical-storage device capable of holding 600 megabytes of information. Using laser technology, CD-ROMs allow users to perform very fast searches of large amounts of data. A CD-ROM drive attached to a microcomputer is necessary to read the compact discs, but microcomputers may be networked together to share CD-ROM drives and discs. Variations include CD/I (CD-ROM interactive, adding sound and graphics) and CD-WORM (Write Once, Read Many [times]). One advantage of CD-ROM technology is obvious: "An F-18 fighter plane weighs 13 tons. So does the documentation that comes with it. The documentation for one commercial airplane comes on CD-ROM and weighs less than 8 ounces" (Keen, 1991a).

Public/Private Sector Cooperation

The Joint Education Initiative (JEdi) program developed by the United States Geological Survey (USGS) has demonstrated an innovative way to access government data provided by several agencies. JEdi is a multimedia educational system delivering data from National Aeronautics and Space Administration (NASA), Jet Propulsion Laboratory, National Oceanic and Atmospheric Administration (NOAA), and the Smithsonian Institution to 500 classrooms throughout the country (Speed, 1992). A workstation consists of a personal computer, a CD-ROM drive, CD-ROM discs, and software to run the program. The data from the participating government agencies are copied onto three CD-ROM discs in the initial program. Twenty teachers worked with USGS scientists for three weeks to develop workbook materials using the data on the CD-ROM discs. Equipment vendors donated complete systems to the participating teachers to promote further development. Although the system was initiated by the USGS, the University of Maryland is now administers the program, a model of technology transfer.

The present system offers real-world data using audio, video, and interactive devices to manipulate data that both teachers and students can manage. Science teachers throughout the United States are responsible for implementation and operation. This program was made possible by cooperation between the public and private sector and volunteer efforts. Computer equipment and other goods and services have been donated by more than 30 companies.

The JEdi project does not have to be limited to these government agencies. The Govoernment Printing Office (GPO), the Patent and Trademark Office (PTO), and the Census Bureau all offer databases on CD-ROM discs. With cooperation between these departments and the USGS, the electronic delivery of government services could greatly enhance educational endeavors in our country (Congress, 1991).

Standards Enhancing Agency Service and U.S. Competitiveness

The PTO's alliance with Europe and Japan to select a common search and retrieval system for CD-ROM-based images and text demonstrates another innovative use of CD-ROM technology. The system was chosen by the European Patent Office (EPO), acting as a procurement agent for the three organizations. The system will allow all users to implement Standard Generalized Markup Language (SGML) to structure patent documents. The system will also permit sequential searching of CD-ROM discs. The PTO's share will cost approximately $300,000.

By purchasing a product with common standards in the international arena, the PTO is leading the way for the interoperability of computer software among government agencies. At the same time, the PTO is offering the opportunity for any small business in the country to have a much simplified access point for international patent records.

Network-Based Access to Agency Information and Services

Agency services may be distributed electronically through a host of technologies. In the 1990s, we see a convergence of telecommunication technologies. A number of telecommunication channels offer a variety of choices for electronic service delivery. The following section describes network-based access currently available to agencies for the delivery of services.

Internet/NREN

The development of the Internet and the establishment of the NREN through the High Performance Computing Act of 1991 (P.L. 102-194) offers government agencies unparalleled opportunities to design and implement a host of information dissemination activities and other services to better meet the needs of the public.

The Internet evolved from work done by the Defense Advanced Research Projects Agency (DARPA) and currently supports, primarily, scientific research and communication (Lynch and Preston, 1990). As a result of the NREN's authorization, however, the Internet is evolving into a broader-based telecommunications system being used by educators, librarians, government officials, and the public (McClure, et al., 1991). As of July 1992, there were some 6,500 networks connected to the Internet, 992,000 host cites, and perhaps as many as 10,000,000 users (Lottor, 1992).

These numbers change daily, but exponential growth, improved interconnectivity, ubiquity, higher network speeds with greater bandwidth, and easier access to the Internet/NREN are the current trends. This growth, the trend toward a broader-based, multipurpose national network, and commercialization of the network will continue throughout the 1990s (Weiss, 1992).

The development of the Internet/NREN, new client-server networking software, and high-speed computing make widespread access to and dissemination of electronic government information an accomplishable goal. The issue is not "if" agencies move to the Internet/NREN but "when," "how," and "with what uses and applications."

Agency Use of the Internet/NREN

There is no comprehensive picture of (1) the number of agencies using the Internet/NREN, nor (2) for those agencies using the Internet/NREN, the types of information dissemination and other services being provided. In a recent analysis, Lottor (1992) identified some 62,000 hosts with a domain of .gov – indicating that some 62,000 governmental units had been allocated an address domain for accessing the Internet.

Knowledgeable Internet spokespersons suggest that it is reasonable to assume that there are between six and ten addresses per host, on average. Assuming, conservatively, (1) that the multiplier is six, (2) that 10 percent of the .gov hosts are state and local governmental units, and (3) that that same 10 percent is offset by non-governmental host sites providing access to government officials through a domain other than .gov, then the number Federal addresses on the Internet can be estimated as 6 X 62,000, or 372,000 accounts.

This estimate is, we believe, especially conservative. For example, we know that at the Library of Congress (LC), the number of accounts on the host is well into the hundreds. Thus, the estimate of accounts accessible to the Internet depends significantly on the multiplier. In the study team's view, the total number of government accounts available through the the various government hosts probably approaches one million.

In spite of the numerous governmental accounts that provide access to the Internet, the number of government information products or services that are accessible over the Internet is very small. For example, a recent study of Federal information locator systems (McClure et al.,1992b) identified only seven agency databases that were accessible over the Internet. In these instances, the service can be characterized as making an existing database available to the general public by accessing it over the Internet/NREN. Thus, the use of the Internet/NREN is less a case of services provision and more one of providing access to government information.

Remote Access to Information Services

Increasingly, government bulletin boards, such as the Department of Commerce's Economic Bulletin Board, are becoming available, primarily via direct dial-up. However, there appears to be interest in and a trend toward making such bulletin boards accessible over the Internet.

Some agencies are already offering access to information services on the Internet. An agency makes its computer an Internet/NREN host, allowing users at remote locations to log onto the agency computer (using Telnet, for example) and search its data base for information. NASA's Master Directory is one example of this approach. Another is the EPA's Online Library System (OLS). The OLS includes the EPA's National Catalog, which contains citations and summaries of the contents of all 28 EPA libraries, EPA documents distributed through the National Technical Information Service (NTIS), and the EPA's Hazardous Waste Collection. The National Institute of Standards and Technology (NIST) and the Department of Commerce have made the Computer Security Bulletin Board System available on the Internet/NREN to encourage sharing of information that will help protect data resources. The service provides reference materials, bibliographies, seminars and conference dates, software reviews, and NIST publications (McClure, et al., 1992b, p. B-5).

FEDIX is an online information system operated by the Library of Congress. It links the Federal government, colleges, universities, and other research organizations to facilitate research, education, and other services. FEDIX currently provides information on ten federal agencies; additions are expected in the future. FEDIX is updated daily and can be reached using the Internet/NREN.

In contrast to bulletin boards, another type of network-based access to agency information is anonymous file transfer protocol (FTP). The agency stores a group of full-text files on an Ineternet host that functions as a file server. Individuals at remote locations can then log onto the agency's computer via the Internet, anonymously using a universal guest password, and download copies of these files across the network to their own local hosts. The Library of Congress, during the summer of 1992, used its Internet node [seq1.loc.gov] to make selected material from its exhibit "Revelations from the Russian Archives" available via anonymous FTP.

A newer network access tool that is rapidly gaining widespread use is the Wide Area Information Server (WAIS), a standards-based method for network information retrieval. WAIS and WAIS-like software comprise a number of programs based on a client-server architecture and designed specifically for network information retrieval. The American National Standard Z39.50, Information Retrieval Service Definition and Protocol Specifications for Library Applications (National Information Standards Organization, 1992) allows connections among databases built on different computing platforms. The USGS operates a WAIS available over the Internet to enable network users to locate and access USGS databases from remote locations (Christian & Gauslin, 1992). Additional approaches to network navigation of interest to the government can be found in the Spring 1992 issue of Electronic Networking: Research, Applications & Policy.

Project Hermes, although currently inactive, serves as a model for effectively delivering government information over an electronic network. The U.S. Supreme Court needed a timely method for promulgating opinions of the Court. Project Hermes made this information available in electronic form and sent it to twelve sites, including the GPO electronic bulletin board and the Cleveland Free-Net, both accessible over the Internet. For the first time, a Supreme Court decision was widely available within hours of the judgment. The project is currently being evaluated, so this service has been suspended. The alternative to this system is to use LEXIS, a commercial online database service that charges $27 per search. During Project Hermes, the same public information was available for the price of a local phone call.

Technology-Related Barriers to Agency Use of the Internet/NREN

The study team identified the following barriers to agency use of the Internet/NREN during the data collection activities:

- There is a belief in some agencies that access to the Internet/NREN is not pervasive enough in society and/or will not serve as an effective communication link with that agency's particular clientele groups.
- There is limited awareness of what the Internet/NREN is and how it might be used to disseminate information or provide other services. There is a wide discrepancy among the various agencies in terms of their knowledge and use of the Internet.
- A lack of specific Internet/NREN operating knowledge exists in many agencies. In some agencies there continues to be a technical literacy problem related to a lack of understanding

about the uses of networks and telecommunications for dissemination of information and services.

- It is difficult for some agencies to establish connections to the Internet/NREN. During our interviews with a number of agency officials, it was clear that specific instructions and guidelines are needed, from a technical perspective, to get connected to the Internet.

Despite these difficulties, there is little doubt that, increasingly, government agencies must move their services into the Internet/NREN environment.

Possible Internet/NREN Services and Applications

To identify what Internet/NREN services agencies might develop and offer, the following service types should be explored:

- Providing access to agency information: For example, the Internal Review Service (IRS) could mount all of its informational booklets for completing various tax forms on a file server, making it available for anonymous FTP. Individuals could then download this information as needed. If this service accounted for only 15 percent of the distribution of such forms, it is still likely to save the IRS considerable resources.

- Disseminating information to the public or to specific target audiences: For example, individual agencies could develop electronic lists of information and services that are automatically distributed over the Internet to "subscribers" among the general public.

- Engaging in a range of value-added services: These services either (1) rely on or use information resources already mounted and available over the Internet, or (2) are "stand-alone" services in which the service is not dependent on some other information resources. Examples of such value-added services can be found in some state initiatives (see Section IV of this report) and in a position paper developed by the Electronic Frontier Foundation (1992).

There is no lack of ideas for the range of types of services that might be provided electronically over the Internet. What is yet unclear is the willingness of the agencies to engage in Internet-based services, the extent to which additional policy is needed to promote such services, and the nature of actual benefits to the public for obtaining access to such electronic services.

Shared Resources

Another form of online service delivery has been established by the Department of Agriculture. The Computerized Information Delivery Service (CIDS) provides the public with access to time-sensitive or perishable agricultural data. The data is available on a commercial time-sharing network. There is no charge for the data, although users must pay an access fee for the network. The State Department, the Commodities Futures Trading Commission, and the National Library Service for the Blind and the Physically Handicapped also use the CIDS system to disseminate information (Environmental Protection Agency, 1991).

This example of agencies sharing software development and hardware appropriations to achieve similar goals should be noted in every IRM department in the Federal government. Sharing systems across agencies ensures not only lower development costs, but central locations for services and enhanced communications among programs, departments, and agencies.

The different methods by which agencies offer information services online is particularly important in view of the current controversy surrounding the Security and Exchange Commission regarding its sole-source vending of the EDGAR database containing Commission information through Mead Data Central. The legislation for EDGAR stated specifically that the data must be "equally available to all persons." Exclusive control over any data by a contractor must be avoided (Gellman, 1988).

Market Creator

Dialog Information Services Inc. is the largest vendor of online databases in the world. Dialog's first public access database, ERIC, was provided by the Department of Education and the Educational Resources Information Clearinghouse (Congress, 1992b). In this case, the government has not only played a role as a market creator, but also helps to sustain the market. Government databases such as ERIC and the Monthly Catalog are not subject to copyright and therefore cost very little for the vendors (e.g., Dialog, BRS, OCLC EPIC) to carry, yet the databases are popular draws.

The government may be in a similar position today to create and help sustain new markets with the potential of the Internet/NREN. The national network is already inspiring new companies to form to provide support, access, and technical assistance.

For almost twenty years, the Department of Education's Educational Resources Information Clearinghouse (ERIC), the GPO's Monthly Catalog, and the National Technical Information Service's NTIS database have provided machine-readable indexes to locate items in their respective collections. The convenience of searching these collections electronically, in a networked environment, is a great improvement over the print indexes.

While these indexes have been made available through commercial online database vendors, there are hundreds of government databases that offer no access to anyone outside the organization (McClure, Ryan & Moen, 1992b). Unfortunately, uniform policies do not exist among and within agencies regarding unobstructed access to quality data for agency or commercial dissemination service providers. The Federal government must make a coordinated effort to provide a policy for agencies to determine which databases will be publicly available, what method should be used for service delivery, and what the acceptable levels of data quality (standards) in these databases are, both for the public to use and for sale to private-sector database vendors.

Telecommunications and Computing Technologies and Applications to Support Electronic Information Service Delivery

In the United States, the telecommunications industry marked a new beginning on January 1, 1984, with the divestiture of the American Telephone and Telegraph Company (AT&T). Rapid advances in telecommunications over the past few years have changed the ways that many organizations operate – from small businesses to government and global enterprises. Fiber-optic cables enable videoconferencing, so individuals can meet with their clients and customers, their employees or counterparts in other organizations conveniently and without regard to geographic location. Electronic mail systems facilitate efficient and timely communications among employees. Organizations in both the private and public sectors are integrating their communications and data, sharing databases and joining networks to eliminate redundancy for cost savings and improved productivity.

Telecommunications and information systems have converged, grown more complex and sophisticated. Local area networks, wide area networks, and regional and national networks have proliferated, and they now link remote, often geographically dispersed users and their information systems and computing centers. Connections among these networks, particularly national networks, such as FTS 2000 and Internet/NREN, will extend these connections to a vast majority of the United States and into international areas. The need for organization-wide communication networks and the view of these networks as organizational resources are taking precedence over single departmental requirements.

Telecommuting

Many newer information technologies allow the dispersion of office workers over time and place. This has become possible as many functions within an office came to be computer-mediated. Over time, many of these computers have been linked to communication networks, which makes communication among them possible. Consequently, it becomes less necessary for office workers to work in the same location. When an office worker's main tasks are linked to a computer, those tasks can be carried out anywhere, as long as the worker is connected to the computer at work. Some have predicted that the advent of low-cost computing and telecommunications technologies will increase the number of "telecommuters," office workers working from their homes. Numerous studies have been conducted on this topic (e.g., Nilles et al., 1976; Wigand, 1986). The State of California has funded relatively recent studies focusing on this topic and its relevance for the greater Los Angeles area.

A study by Arthur D. Little (1992) investigated the extent to which savings could be realized by replacing the movement of people (transportation) with the movement of information (telecommuting). Moreover, this research also investigated the societal gains achieved by reducing the burden on the transportation infrastructure by the partial substitution of modern telecommunication technologies.

For example, a reduction in travel ranging between 10 and 20 percent through telecommuting would generate the following impact:

- Six million automobile commuters could work at home
- Almost three billion shopping trips would be avoided annually
- Almost 13 million business trips each year could be handled instead by telecommunication technology-mediated means, and travel over more than 500 miles of transport routes (road and air traffic) could be replaced each year by electronic document transfer.

Using conservative prognostication methods, the resulting annual savings would yield an amount of $23 billion. When compared to other measures in improving transportation, such as intelligent vehicles and roads, alternative fuels, and magnetic levitation, the substitution of telecommunications for actual travel and transport showed considerably higher payoffs. The study also reports that, to achieve those gains, such a telecommunications effort requires a proper linkage to the nation's information infrastructure. Specifically, it requires that a critical mass of homes be connected to a fiber-optic network, while their owners are telecommuting for the government.

Fiber to the Home

The anticipated total costs of bringing fiber-optic connections and the user equipment to the home may amount to $300 billion nationwide. Costs for just the fiber-optic connection to most homes are approximately $200 billion. The current existing information network already supports, to some extent, work at home, teleshopping and videoconferecing, but the current copper-cable-based network of 2.4 kbit/s would be increased to 45 to 500 Mbit/s with the fiber-optic route. Such an upgrade would offer many new services that currently cannot be realized, such as the extensive use of color in transmissions. Such a development would also increase the nation's overall competitiveness with other nations, as information, data, etc., could be transmitted much faster and in a more geographically dispersed fashion.

FTS 2000

The first round of the procurement process for the Federal Telecommunications System 2000 (FTS 2000) ended on April 29, 1988, after three proposals had been submitted. The General Services Administration (GSA) awarded contracts to AT&T and Sprint to provide Federal telecommunication services. The overall FTS, including its long-distance portion (known as FTS 2000), is the largest private telecommunications system in the world. Moreover, one might view this system as perhaps the single most critical system for non-military day-to-day operation of the Federal government. FTS 2000, designed as a first-class, state-of-the-art, cost-effective telecommunications system, aids the U. S. government in its aim for productivity improvement.

Recent controversy concerning FTS 2000 has arisen with regard to AT&T's and Sprint's allegedly high prices, as well as the government's poor billing system (Messmer, 1991). The GAO asserted that the government paid $148 million more for services in fiscal years 1991 and 1992 because AT&T and Sprint had not reduced their prices to rates commercially available in the open market, as called for in the FTS 2000 contract. The contractors, however, argued that the network management services available under FTS 2000 make this network different from commercial services. Moreover, Congress has taken the GSA to task for failing to maintain the proper 60-40 split between AT&T and Sprint in FTS 2000 revenues. AT&T was awarded 60 percent of the contract, yet was picking up only about 40 percent of the traffic. The GSA then found itself in the difficult position of trying to come up with more network traffic for AT&T.

The Federal government workforce comprises about two million civilian employees. As the tenor of the present study reflects, increased concern exists about the capability and capacity of this workforce in a dynamic and more complex world. It is important to point out that in meeting those needs, FTS 2000 has demonstrated that large customers can obtain lower service prices outside of standard tariff offerings. This no doubt is due to market power and competition. In turn, the FTS 2000 experience might suggest pursuing similar avenues with other information and telecommunication technology acquisitions. FTS 2000 presents a unified source of supply and management methods to agencies to meet voice, data, video and other integrated service needs. The FTS 2000 configuration constitutes a massive infrastructure on which government agencies can design and build new systems and applications. For the taxpayer, FTS 2000 is intended to provide annual savings of more than $150 million.

Linking FTS 2000 with Other Networks

When focusing on a potential configuration of a national information infrastructure, it becomes apparent that FTS 2000 is a key component of that infrastructure. It is, however, important to continue providing linkages to other networks, such as the public switched networks of the regional Bell operating companies (RBOCs). The RBOCs must be included in such a configuration, because they constitute a central link to most end-users in the residential and business markets.

Through AT&T and Sprint and their linkages to other networks, every citizen with a telephone or access to a telephone can technically be reached. Ninety-three percent of all U.S. households have a telephone. The nation might rely on these RBOCs and other telecommunication companies to provide advanced telecommunication services via their networks, such as transaction services, home services (protection, monitoring, measuring, diagnosing, etc. of water usage, security, energy management), electronic mail, message services, public announcements, access and retrieval to information services, etc.

A most important linkage in need of thorough exploration is the connection of FTS 2000 and other government networks to the Internet. Such a linkage alone would represent a substantial extension of service provision in reaching certain targets of citizens. The Federal government would then be able to overlay its information services on the network where appropriate. Many questions need to be addressed, such as how to configure the information service, what type of service is appropriate, how to achieve interconnection between FTS 2000 and the Internet, the placement of gateways (where, how many, under whose control), and others. Finding the answers to these questions is an important next step toward the creation of a national telecommunications infrastructure.

Electronic Data Interchange

Electronic data interchange (EDI) is one of the paper-reduction applications using computer and telecommunications technologies to reduce the cost of processing purchase orders, invoices, and other documents and to better match client/customer demand with market supply (Wigand, 1992). A critical mass of EDI users exists not only in certain industries, but also in certain areas within the government sector (e.g., defense, health and human services with the private insurance industry). Several superb EDI applications have been reported within the government sector. Marion (1992) notes that applications like EDI, office automation, and records management depend on specific enabling technologies.

In November 1991, Secretary of Health and Human Services Dr. Louis Sullivan convened a forum of national health-care leaders to discuss challenges of reducing administrative costs in the U.S. health-care system. Among several industry-led workgroups was the Workgroup for Electronic Data Interchange (WEDI). Its report from July 1992 reflects the efforts of a truly genuine public and private partnership over a six-month period. The workgroup was co-chaired by the presidents of the Blue Cross and Blue Shield Association and The Travelers Insurance Company. In addition to a 15-member steering committee, the workgroup had access to about 50 technical staff. The preliminary savings of EDI were estimated at $4 billion to $10 billion (Workgroup for Electronic Data Interchange, 1992). This example demonstrates both how EDI presents an information and telecommunication technology opportunity in which good public policy and good business sense converge and how industry can cooperate with government as a partner rather than an adversary.

ISDN

Modern communications-based applications increasingly require a degree of flexibility, user control, capacity, economy, responsiveness, and integrative capability beyond that provided by traditional telecommunications networks. Such capabilities are provided by integrated services digital networks (ISDN). Some have viewed ISDN as an emerging technology with the potential to be as significant as the computer chip, optical fiber, and the transistor. Others argue that ISDN has already been replaced by such forthcoming applications as SONET.

ISDN is a public end-to-end digital telecommunications network providing the capability to transmit voice, data, facsimile, telemetry, signaling (or dialing), and slow-motion video, either simultaneously or separately, on a single telephone line, typically existing or newly installed twisted-pair wires or optical fiber (Wigand, 1988b, p. 30). Since the transmission and reception of signals are digital, the sending and receiving devices (e.g., two computer terminals) may be of brands that were previously conceived as being incompatible. This means, for example, that an IBM computer and an Apple computer could communicate on line without any protocol conversions.

ISDN integrates a variety of communications applications into one network rather than requiring separate lines. If comparable transportation vehicles existed, analogously they could fly at either jet or propelled speeds, roll leisurely down the road or roar around a race track, cruise a quiet lake or aquaplane across an ocean--with one thousand passengers aboard. ISDN may also be compared to an interstate highway system: a fully digital Autobahn capable of carrying all shapes, sizes, and numbers of vehicles (trucks, automobiles, motorcycles, buses) that merge and flow together at predetermined maximum and minimum speeds until a vehicle decides to exit this network for a particular destination. Similarly, with ISDN, a vast number of information packages (vehicles) join and move along this information highway digitally. When these information packages have reached their destinations, they exit as computer data, messages, phone calls, signals, pictures, etc.

Worldwide standards, except in the United States, have been under deveopment, coordinated by the 160-plus-member, Geneva-based Consultative Committee on the International Telephone and Telegraph (CCIT), a branch of the International Telecommunications Union. In February 1991, however, U.S.-based ISDN operators announced that they would adopt Bell Communications Research's NI-1 specifications (Sweeney, 1991), and in November 1992 ISDN vendors heralded the Transcontinental ISDN Project 1992 as the beginning of so-called national ISDN (Wallace, 1992; Metcalfe, 1992).

Wigand (1988) argued that in the future the U.S. communications policy and the fragmented U.S. communications infrastructure may even leave some users stranded by creating incompatible ISDN implementations. Even though a so-called national ISDN standard has supposedly emerged, organizers of the Transcontinental ISDN Project 1992 failed to mention that most of the states west of the Mississippi River will not be able to get ISDN services based on the new National ISDN-1 specifications (Sweeney, 1992, p. 1). Two of the seven regional Bell holding companies, Southwestern Bell and U.S. West, stated that they do not intend to deploy NI-1 software in their central office switches due to incompatibilities with their existing ISDN operations. Such a lack of solidarity in deploying NI-1 software does not bode well for vendors that are trying to convince users to adopt ISDN (Wigand, 1988). The consequences of such a strategy in terms of national competitiveness vis-a-vis other nations will emerge in time, as ISDN becomes a competitive issue in U.S. corporations' competition with Europe and the Pacific Basin countries. One can hardly claim that national ISDN has emerged in the U.S. (Sweeney, 1992, p. 51). Nonetheless, a key concern for the government is to provide leadership in orchestrating compatibility and interoperatiblity among ISDN and other evolving standards.

Data Security and Privacy Technologies

Networking technology has brought with it the means to access and modify data from remote locations, exacerbating existing concerns about maintaining data integrity. "The double-edged sword of computing not only expedites and simplifies the transfer of [information], it also aids and abets the invasion of privacy" (Davis, 1990). Computerized data, much more than its print counterpart, can be tampered with – deliberately or inadvertently – in a number of ways. The Commission on Federal Paperwork (1977, p. 130), identified four types of potential threats against an information system:

- Disclosure: The act of making confidential information public, either intentionally or by inadvertent release
- Diversion: The act of copying or accessing confidential information in order to realize some private benefit other than public disclosure
- Alteration: The act of changing confidential information, intentionally, to realize some benefit or avoid some penalty, or by accident, introducing errors which may affect certain benefits, penalties, or statistical findings
- Destruction: The act of either physically or magnetically destroying information which might impair enforcement, administration, or regulatory activities, or which might require recollection from the respondents – either intentionally or by accident.

One method of ensuring data integrity is the electronic signature/data authentication system being developed by NIST for the Corps of Engineers. Expected to revolutionize the way the Corps handles financial management, this system links an individual's unique electronic signature to the data contained within a document, thus ensuring both that the data is not a forgery and that it was not altered in any way.

The system's design incorporates a set of Federal Information Processing Standards (FIPS) and the American National Standards Institute (ANSI) standards, and has been deemed acceptable for entering into electronic contracts with the Federal government. With the security provided by the electronic signatures and data authentication, the Corps of Engineers envisions a paperless procurement process in which procurement documents, contracting documents, invoices, receiving reports, and payments are all transmitted electronically. The savings are expected to reach close to $600,000 a year, or nearly $6 million over a ten-year period.

There has been a good deal of work in the private sector to ensure both data integrity and user privacy. David Chaum (1992) has been working with the Center for Computer Mathematics in Holland to develop blind signatures, which facilitate the use of an electronic service without being tracked by the service provider. A digital signature attached to a transaction provides for system security but not user privacy. The blind signature method works with a digital signature by encoding each transaction uniquely so that the service provider cannot track usage patterns. While this technology is still being tested, it holds promise for protecting users' transactional privacy. As the government begins delivery transactional services electronically, developing adequate privacy protections of this kind will be of great importance.

Also at issue is the need for people with various levels of security clearance to access information from the same database. Until recently, agencies had the choice of providing all users with equal access, or duplicating databases with varying degrees of detail. Now, however, the technology exists to enable users with different security levels to share a single database, yet gain access only to the information for which they have clearance. The Oracle Corporation's Oracle7 relational database, the first application of its kind to pass NIST's Structured Query Language (SQL) conformance test, surpasses the National Security Agency's National Computer Security Center's evaluation criteria (Danca, 1992) and holds great potential for protecting confidential information without sacrificing valuable and limited resources nor worker productivity.

Information Technologies

No listing of information technologies could ever claim to be exhaustive, since the rapid pace of development renders such attempts incomplete even before publication. However, there are several information technologies not detailed above that deserve a brief mention.

A recent study by Datamation (Marion, 1992) of 1,800 managers from all ten key sectors within U.S. public- and private-sector organizations reports that the most popular information technologies for 1992 mentioned by information systems (IS) managers are the following: LANs (43%), client-server architecture (43%), graphical user interfaces (GUIs)/Windowing (37%), bar-code processing (35%), and relational databases (33%). The most popular applications in 1992 were reported to be LAN management (30%), electronic mail (27%), office automation (24%), records management (23%), and financial reporting (22%).

Cable television needs little explanation, now that the technology has made significant inroads in almost every community in the United States. A government information channel designed to assist citizens in program awareness and support would be an elegant and effective way to transmit the enormous amount of Federal, state, county, and local government information. The list of potential applications is enormous. A one-hour presentation delivered weekly from January to April 15 by the IRS, explaining forms and filing procedures, for example, would be greatly appreciated by many citizens. Interactive television may be the next step, by creating a two-way link between the viewer and the program producer (Antonoff, 1992).

Toll-free telephone assistance, supported by the use of voice mail or trained customer service representatives, has had great success at the Department of Veterans Affairs and at the Small Business Administration. A single toll-free number to all government services information, available 24 hours a day, would be the logical extension of this type of service.

Videoconferencing, a popular technology in American business, has the potential to be yet another vehicle for service delivery, enhanced by the possibility of interaction between the service provider and the viewer.

Human interface technologies substantially improve human-machine interfaces and rapidly bring information from its many sources and many forms to people. Such technologies include speech recognition, voice input-output interfaces, natural-language interfaces, high-end workstations, executive information systems, mouse access, touchscreens, light pens, windows, etc.

Communication technologies enhancing data and person-to-person communications include voice-mail, electronic mail, facsimile, VSAT, EDI, high-end work stations, ISDN, desktop publishing, and LANs.

System support technologies that underwrite systems development and maintenance include computer-aided software engineering (CASE), CD-ROM and optical storage technologies, relational databases, 4GLs/query languages, prototyping, personal computers using 32-bit or advanced chips, hypertext, and hypermedia.

Technologies with ongoing development in the 1990s include stand-alone expert systems, artificial intelligence, client-server technologies, generalized decision support systems, digital libraries, data extraction and conversion software, online external database searching technologies, private branch exchanges (PBXs), and personal information management software. Technologies not yet mature include biomolecular computing, nanotechnology, and neural networks.

Andersen Consulting (1991) performed an analysis of the challenge of business integration in the fourth edition of the Trends in Information Technology series. The report specifies five key technologies enabling business integration in the 1990s: (1) multimedia will be an essential enhancement to the human-computer interface; (2) cooperative processing will shift the focus from centralized computing to interconnected desktop workstations; (3) telecommunications and interorganizational networks will need to be monitored for rapid developments to ensure a place in the global arena of competition; (4) object-oriented systems development will structure systems around the data itself; and (5) CASE will allow developers to spend more time solving problems and less time on system development.

Space limitations do not allow detailed descriptions of the information technologies listed above. The electronic bulletin board is one IT, however, that has been utilized for several years by Federal agencies. These systems are rapidly proliferating throughout the government, due to the simple technology behind the service and the inexpensive start-up costs. Applications of this technology demonstrate what should and should not be done when offering a government service electronically. A case study of this technology is provided below.

ANALYSIS OF AN EVOLVING INFORMATION TECHNOLOGY: THE CASE OF FEDERAL ELECTRONIC BULLETIN BOARDS

Bulletin board systems (BBSs) are one technology that the Federal government has been utilizing in many capacities during the past decade. Moreover, the number of Federal BBSs appears to be on the rise. As such, while BBS technology is neither new nor innovative, a closer look at this technology and its applications provides an opportunity to discuss the successes and failures of the Federal government's more recent efforts to deliver services electronically.

Bulletin board systems are increasingly being utilized by Federal agencies as vehicles for access to and dissemination of government information, as well as non-government-related topics. It is difficult to count precisely the number of existing accessible Federal BBSs; one current estimate places the total around 90 (Federal government bulletin..., 1992, p. 42; Smith, 1989). The study team's experiences with using these BBSs and comparing various directories, however, suggests that there are probably some 150 to 175 publicly accessible Federal BBS. Federal BBSs are operational during a variety of times and days: business hours only, weekdays through the evening, and 24 hours a day for 7 days a week.

The information provided through the Federal BBSs varies in scope from the latest government economic indicators to simple email exchange forums to advice on IT purchases. Further, Federal BBSs serve a variety of users: the general public, government contractors and vendors, agency personnel, and Federal employees.

BBS Missions

Many agencies operate BBSs without clear definitions of purpose, but some agencies do have a specific information policy/mission for their BBSs. For example, the EPA and NOAA run the Gulfline BBS, whose purpose is described thus:

> Environmental problems in the Gulf have been studied by several Federal agencies in the past. These agencies include the efforts undertaken by EPA, the studies supported by the Minerals Management Service (MMS) associated with offshore oil and gas development, and research and monitoring programs supported by NOAA. State and local agencies have also supported environmental studies in the Gulf of Mexico. An important objective of the Gulf of Mexico Program is to ensure that the data collected are available to the Gulf regional resource managers. This will guarantee that efforts undertaken in the future are done so with a clear understanding of what has been accomplished in the Gulf of Mexico. The Gulfline BBS is intended to facilitate peer-to-peer communication and cooperation and information transfer between agencies involved in these issues. (Gulfline, 1992)

Indeed, one important key for a successful BBS is to have a clear understanding of the BBS's objectives, scope, and intended audiences.

Types of BBS

Smith (1989, pp. 23-24) places Federal BBSs into six categories, five of which are presented below:

- Electronic Mail/Messaging: This type of BBS mainly serves as a message posting board. Specific examples include the Office of Personnel Management's Washington, D.C., and regional jobs listing databases.
- Public Announcement: Public announcement bulletin boards inform the public about agency meetings, regulations, actions and publications. Examples include the EPA's Cleanup Information BBS, as well as the Federal Energy Regulatory Commission's Issuance Posting System.
- Electronic Publishing: Electronic publishing BBSs are directly related to cost avoidance. That is, they intend to avoid the high cost of printing government documents and publications. Specific examples include the newly established Government Printing Office's Electronic Information Dissemination Services (EIDS) bulletin board, as well as the Energy Information Administration's (EIA) BBS.
- Data-Oriented: Data-oriented BBSs provide government data on specific topics. An example of one such BBS is the Department of Commerce's Economic BBS, which provides monthly gross national product (GNP) figures, personal income data, Consumer Price Index, Treasury rate quotations, and various other economic data.
- Library-Oriented: Library-oriented BBSs allow for the dissemination of research material to the library community and provide a vehicle for communication between central and regional libraries. One such BBS is the American Library Forum (ALF) provided by the Department of Agriculture's National Agricultural Library. Another example is the Automated Library Information Exchange (ALIX) run by the Library of Congress.

To these five categories we would add:

> Regulatory: EPA's and NOAA's Gulfline include as a part of its contents the Environmental Toxic Release Inventory, which contains EPA regulatory mandates.
>
> Procurement and Licensing: The Air Force created the Small Business BBS solely for the purpose of supporting its procurement process. This BBS provides guidelines for businesses dealing with the Air Force on acquisition projects, and is estimated to reduce procurement turnaround time dramatically. The Federal Communications Commission's Public Link Access BBS provides those vendors who submitted license applications to the FCC with status information on their applications.

The above categories are presented as possible means of BBS classification. However, they are not mutually exclusive. In fact, many Federal BBSs provide a combination of the presented services.

Federal BBS Examples

The Commerce Department has been operating a very successful electronic bulletin board for several years, offering information on economic indicators, including the consumer price index, the GNP, and personal income statistics (Congress, 1992a). Further, the Economic Bulletin Board (EBB) provides press releases from 18 Federal agencies, as well as an events calendar and online utilities (Sandler, 1992). It should be noted that the EBB operates as an enterprise operation, recouping all of its operations costs through user fees and connect-time charges.

The GPO began to operate a public bulletin board on September 1, 1992 to serve as a central point of access for documents, notices, and publications produced by various Federal agencies, including the EPA and the Departments of State and Energy. The GPO is encouraging other Federal government agencies to take advantage of this resource by contributing their information products for dissemination. Others are likely to join if the Federal Bulletin Board becomes widely used. This bulletin board establishes a central access location for various types of government information shortly after the information is released. Information on the bulletin board includes Medicare pricing plans, energy data, and other information affecting businesses, as well as local and state agencies. All files can be ordered on disc as well (Herman, 1992a).

The GPO bulletin board is a fee-based system that charges users per downloaded file. The fee is assessed by the size of the downloaded item, with the current average fee estimated at $6 per file. GPO officials consider the service to be very low-priced; e.g., a 50-Kbyte file starts at $2, while the maximum charge for a 1-Mbyte file is $21.

The Small Business Administration (SBA) offers free information services to small business owners throughout the country (Kyriakos, 1992). Sprint Communications is providing SBA with national toll-free numbers for the bulletin board. Additional sponsors include Dun & Bradstreet, Apple Computer, Microsoft, and Sony Corp. of America.

BBS Technology and Service Concerns

While BBS technology is neither advanced nor difficult, the Federal government has not implemented BBSs with constituent service provision in mind. Several problems exist with current implementation strategies:

- Lack of a clear audience target: In general, Federal BBSs are an agency technological toy looking for someone with whom to play. No clear end-user is defined.

- BBSs are not necessarily accessible: While most BBSs are open to the public, they are not actually accessible. Access implies that a user is aware of existing BBSs, and has the technological means to connect to them.

- BBSs are not free: With few exceptions, Federal agencies do not charge the public BBS user fees. However, exceedingly few BBSs have 800 telephone numbers. As such, users must generally incur long-distance telephone charges.

Moreover, many of the Federal BBSs have differing procedures for log-in and use, the lack adequate help screens, and there is no central gateway or locator for the BBS. This type of growth and development is endemic of Federal IT applications.

What Purposes Do BBSs Serve?

Electronic Federal BBSs serve, at least in part, the following purposes:

- They permit access to government information: Through the use of a BBS, a Federal agency provides its audience with electronic access to government information. More importantly, if agencies had to provide only one electronic copy of agency documents (most of which already exist due to word processing), more documents could be made available to users of government information.

- They are vehicles for the dissemination of government information: Electronic BBSs can serve as a one-stop shop for electronic agency documents. Further, agencies may be more willing to make available single copies of electronic documents that can be downloaded multiple times, rather than relying on costly printing methods.

- They perform a public service by keeping citizens informed: When users are made aware of and given proper access to BBSs, BBSs may well serve as instruments of democracy by maintaining a well-informed citizenry.

- They enhance agency revenue: Cost recovery is certainly one aspect to Federal BBSs. Agencies may opt to charge user fees for the provision of electronic access to agency information. Various pricing schemes exist, such as that developed by GPO and EBB.

- They may meet statutory requirements for making certain types of government information available to the public: Through appropriate access and dissemination policies, agency BBSs may in fact, in a cost-effective manner, allow agencies to meet their legal requirements for public access to government documents.

BBSs Service Possibilities

Federal bulletin boards, as they now exist, do not deliver constituent services. However, BBSs have the potential to provide both information and other services. For example, the IRS could create a BBS with an 800 telephone number and store downloadable tax form instruction booklets on it. The current

IRS procedure for obtaining an instruction booklet and forms requires customers to call an IRS 800 number, speak to an operator, specify the booklets sought, have the operator place a mail order, and then wait for the arrival of the forms. With a BBS, customers could browse the BBS's contents, choose the desired files, and download them within minutes. The IRS avoids mailing and clerical costs, while the customer saves time.

Another example of a service-oriented BBS might be one offering downloadable Congressional documents. Currently, constituents may call Congressional document rooms and request copies of bills, hearings, and other documents. A Congressional BBS on which such documents are stored in electronic form could be established for constituent downloading. Once again, Congress saves on postage and clerical processing, while constituents save in time.

These two examples could easily come into existence. Most, if not all, government documents are now word-processed and thus are already stored electronically. Files could be made available for dissemination in several file formats (ASCII text files and other popular word-processing programs) to facilitate constituent use.

Assessment

The technology involved in an electronic bulletin board is simple and inexpensive. BBSs will undoubtedly continue to flourish across government agencies. Major problems exist with this technology, however. How will agency staff and citizens learn about the existence of such resources? How will constituent access to Federal BBSs be guaranteed? How can use of the BBSs be standardized and seamlessly linked? Without some common locator tool, coordinated and updated by a single agency, electronic bulletin boards will serve only a small portion of their potential audiences. Without the necessary computer equipment and 800 telephone numbers, many constituents will simply not be able to receive the benefits of electronic BBS services. The government must have a plan to provide access to these BBSs. One method of equal access provision would be to provide public access terminals in depository libraries.

The examples above show how a critical mass of government agencies, as well as citizens and corporate users, are needed to make the bulletin board successful. The pricing of bulletin board services is of considerable importance. If the price is too high, potential users will be discouraged; if the price is too low, costs for the service are likely not to be recovered. The pricing dilemma is complex in that it may be necessary to operate at a "loss" for a time until a critical mass of users can support a system.

Standards for the BBSs are also a key issue. Agencies have not agreed on a common standard through which information is submitted to bulletin boards, and then downloaded into common software applications (e.g., word processing programs, spread-sheets and database management programs). These standards must be agreed upon if this technology is going to serve a large base of users.

While Federal government bulletin boards facilitate information access, they lack the technical sophistication that most private-sector bulletin boards typically offer. For example, the many files have no uniform format or common search words since they are presented according to the dictates of each agency. Also, citizens should not be expected to have to remember hundreds of BBS phone numbers and interfaces. The technology exists to provide a single source gateway to these bulletin boards. Every Federal agency currently offering a BBS should be making an effort to support a standard front end to these disparate services. One might also argue that agencies would be better advised to move their services to the Internet/NREN environment rather than developing services on BBSs with delivery system already out-of-date and unsophisticated.

A STANDARDS FOUNDATION FOR INNOVATIVE INFORMATION TECHNOLOGY

Information technology standards address such issues as compatibility between systems and networks, the costs of software development and maintenance, security, data preservation, and resource sharing. The promise of standards is that long-term costs can be more effectively controlled if the IT chosen adheres to accepted technical standards. A Radack (1990, p. 39) states:

> Standards are a means to achieve common solutions to common problems such as improving staff productivity, overcoming incompatibilities between systems and networks, and reducing the costs of software development and maintenance. Standards are particularly important today as tools for managing change, for preserving investments in technology, and for protecting the increasing volume of computer data that are stored and processed.

The slow pace of standards development has been at odds with the rapid pace of IT development.

Open Systems Environment

In the increasingly internetworked environment of information processing and IT, hardware and software based on proprietary systems and their protocols limit the potential for sharing information and delivering services across the wide variety of platforms existing in the installed base. Recognizing this problem, NIST has been promulgating a variety of FIPS to support its Applications Portability Profile (APP). APP is the Federal government's program to establish an open systems environment (OSE) for IT. Operating since 1989, APP relies on a foundation of specific standards, such as the Portable Operating Systems Interface (POSIX -- FIPS PUB 151), the Government Open Systems Interconnection Profile (GOSIP -- FIPS PUB 146-1), and others.

Information and telecommunications technology vendors in the past did not provide the open architecture solutions that organizations needed. The Federal government is no different from the private sector, in that agencies built their data processing and communications infrastructure one brick at a time. Not only did this occur in a piecemeal fashion, but agencies also tended to procure different bricks. These systems do work nevertheless, but a major current concern is that users and managers alike want all their systems to work together, i.e., allow integration, interconnection, and interoperability.

In terms of a strategic direction, agencies view integration as one of the most critical areas. The economics of client-server, desktop, and workstation computing are of a magnitude that they simply cannot be ignored. In that sense, the appeal of an open systems organization is cost-efficiency. Possibly within just a few years, openness may be worth a premium, as it may become difficult to support proprietary systems. Industry analysts claim that by streamlining the organization within an open systems framework, new applications can be built 15 to 20 percent faster.

New and Emerging Standards for Information-Related Applications

A host of standards are emerging to deal with the evolving IT universe in which government services may be delivered to citizens. Many of the examples discussed in this report have based their implementations firmly in existing standards or have chosen applications that are standards-based, e.g., a SGML-based CD-ROM product or an ANSI/NISO Z39.50-based network retrieval application (National Information Standards Organization, 1992). Yet a number of implementations are moving ahead even when there are no existing standards (e.g., the USDA's electronic benefits transfer and smartcards, kiosks). There are also areas in which standards have yet to mature and stabilize and areas where there are as yet few off-the-shelf standards-based products and applications available. This is true especially in the Open Systems Interconnect (OSI) environment.

Another area of concern that standards need to address relates to network applications for security and authentication. There are related FIPS for data encryption, authentication, etc. A number of participants in the network focus group suggested that security and authentication are essential for further development of networked-based products and services. NIST is rewriting FIPS PUB 140, General Security Requirements for Cryptographic Modules, a standard for using the Data Encryption Standard (DES) in telecommunications networks. In 1991 NIST released for public comment a proposed FIPS for Digital Signature Standard (DSS). Both of these efforts derive from the responsibilities NIST was charged with by the Computer Security Act of 1987 (Congress, 1992c).

One method of delivering services electronically that can bring the service to the recipient's home is television. New standards for digital television, digital image standards (Stackhouse, 1992), will enhance the convergence of television, telecommunications, and computer networks. Advanced digital television may not only be the window on the world, but open a new window on government service provision.

NIST continues to issue FIPS that mandate the use of particular information processing standards. For example, in 1991, NIST adopted in FIPS PUB 161 the recognized national and international standards for EDI. This will assist agencies that are moving to exchange electronically information that had previously been exchanged on paper forms. The Working Group for electronic data interchange has recommended that the Department of Health and Human Services utilize EDI in its administrative dealings with U.S. health-care and insurance providers. EDI will also serve as a foundation for increased use of electronic contracting. Currently, the U.S. Air Force in its Desktop IV procurement of PCs is using floppy diskettes and an electronic bulletin board to speed up the procurement process. EDI may be the next step to take in electronic contracting.

In November of 1992, ANSI voted to adopt the Electronic Data Interchange For Administration, Commerce and Transport (EDIFACT) by 1997 (Schwartz, 1992). While this new development may cause problems for those institutions currently using or implementing the X12 standard (developed in the 1970s) for EDI, the adoption of the EDIFACT standard allows the United States to conduct electronic transactions and process claims seamlessly in the international arena without protocol conversion.

Information technology has brought the issues of technical standards clearly to center stage. NIST, information resources managers, and many others will play increasingly vital roles in the development, promulgation, understanding, and use of technology standards for electronic service delivery. Policy and operational guidelines must encourage agencies to pursue appropriate standards-based solutions in IT implementations.

AGENCIES SHARING KNOWLEDGE ABOUT INNOVATIVE TECHNOLOGY

A common problem of any large organization is communication between and among departments. Not only do large Federal agencies face this problem within their agencies, but the Federal government must manage to somehow convey new ideas across agencies. The Special Interest Group on CD-ROM

Applications and Technology (SIGCAT) sponsored by the USGS has managed to perform this role in the past few years, regarding information technologies in general and CD-ROM technology in particular. SIGCAT meetings are held bimonthly, run a full day, are free of charge, and provide members with experiences in the field and updates on the technology and applications (Special Interest Group.., 1992). The USGS announced in October 1992 that it will sponsor another interest group, the Special Interest Group for Wide Area Information Servers (SIGWAIS). This group will discuss the applications and experiences of implementing WAIS servers for access to databases using Internet/NREN.

The communication between agencies regarding innovative technology seems to take place on a quasi-official level, with the driving force being a motivated individual championing the technology. The Federal government should be formally supporting these SIG efforts, as well as creating a mechanism for agencies to share technology information that might cover a wider scope than these two SIGs, such as promoting SIGs to be formed in various agencies, provided no two agencies form a SIG on the same topic.

An existing forum for information resources managers is the Federal Information Resources Management Policy Council (FIRMPOC). FIRMPOC provides an opportunity for IRM staff to exchange information on technology applications and projects. For example, FIRMPOC has recently established an Interagency IRM Infrastructure Task Group to examine issues related to deploying a modern information infrastructure (Office of Management and Budget, 1992, p. III-10).

It is crucial that agencies share knowledge and information when implementing new technologies. When agencies share information, innovative information technologies can be cost-effective, service-enhancing, and problem-solving tools. Moreover, there is no need for agencies to "re-invent the wheel," and strategies should be developed for agencies to jointly design and operate electronic services.

INFORMATION TECHNOLOGY INNOVATION AS PROBLEM SOLVING

Information technology offers agencies a multifaceted potential for innovation. The innovation can be the application of the technology itself, the re-organization of productive activities, or an idea of how to deliver services more effectively, efficiently, or in a quite different manner. "An innovation is an idea, practice, or object that is perceived as new by an individual or other unit of adoption." Associated with the notion of innovation is the notion of alternative. An innovation offers alternative ways to solve existing problems (Rogers, 1983, p. 11).

An agency may recognize a generalized problem in the delivery of services. One of the solutions to the problem may be the application of IT. The information resources manager can play a central role in the problem-solving process by aiding the diffusion or communication of innovation through the organization. Information about innovations within and outside of the organization is an information resource that the IRM framework needs to acknowledge. An awareness of innovative applications of IT by the information resources manager allows him to act as a resource in the problem-solving process.

Innovation can occur at all levels of the agency. Information technology, as discussed above, can contribute to new ways of doing old activities or to the establishment of entirely new services. Yet, effective innovation needs to be shared. IRM can assist this diffusion, which is a "process by which (1) an innovation (2) is communicated through certain channels (3) over time (4) among the members of a social system" (Rogers, 1983, p. 10).

Increasingly, electronic technologies such as the examples mentioned above are being used/implemented to provide constituent services. The diversity of these technologies is great, and requires responsible management. In effect, a good IT-service fit cannot exist without a proper management framework. The following sections will detail the role of management in general and IRM in particular in the selection, implementation, and management of IT used for government service delivery.

INFORMATION TECHNOLOGY AS A FOUNDATION FOR SERVICE

The technologies discussed in this section will play a key role in the effective and efficient delivery of government services. As demonstrated in several examples above, IT implementation will not be not successful unless deployed in a dynamic environment. Funding sources, the delivery infrastructure, management practices, and encouragement of experimentation must be part of a government-wide initiative to design, build, and provide services, within and among agencies, and to the citizen.

Table 1 describes a range of information technologies suitable for service applications. This is not an exhaustive listing, but rather a brief review of possible technologies and service applications for the present and near future. The table lists each technology, suggests possible applications, and offers references to obtain additional information.

Vice President-elect Al Gore recently asked: "Shouldn't we be giving a lot more emphasis to the kind of national infrastructure we need to share information and create and share knowledge?" ("Clinton Plans to..., 1992, p. 24). The answer is an unqualified "YES." But, building an information infrastructure cannot be accomplished on an agency-by-agency basis. Independent, uncoordinated agency efforts at IT implementation will lead to duplicate research and development efforts, disparate interfaces, system incompatibilities, and very confused users.

The Federal government must develop a coordinated, well-planned approach, guided by new policies, and implemented government-wide that specifically addresses the uses and applications of IT if electronic services will be successful. Closely linked to deploying this technology successfully is the need for a redesigned management approach. The next section discusses the components of this redesigned management strategy and how they contribute to successful electronic services provision.

TABLE 1
Information Technologies and Possible Government Services

Technology	Description	Service Possibilities	For Further Information
Kiosks	Similar to automatic teller machines, multimedia touchscreen terminals provide information and possibly program transactions available 24 hours a day.	Information dissemination Electronic benefits transfer Government forms Applications and documents Filing tax returns Filing FOIA requests Passport applications Applying for Federal benefits and grants	North Communications and Public Technology Inc. (1991/1992). North Communications and Public Technology Inc. (1992) Hanson (1992) Moore (1992) Public Technology Inc. (1992)
BBS (Electronic Bulletin Board System)	An online (dialup or network connection necessary) computer service that allows exchange of messages, reading of news, and uploading or downloading of software and data files.	Information dissemination, particularly for time-sensitive information, instructional booklets and manuals (e.g., IRS form instructions) Possibly for ordering materials (e.g., GPO documents) Vehicle for information exchange between government and constituents (e.g., e-mail)	Gamble-Risley & James (1992) Herman (1992) Messmer (1992)

Technology	Description	Service Possibilities	For Further Information
Smartcards	A plastic card the size of a credit card that contains an embedded computer chip. The chip's memory contains profile information about the owner of the card. Currently used by the Department of Agriculture to store information about quotas and prices for peanut farmers. Each time a farmer sells crops, the amount is deducted from the farmer's smartcard.	Electronic benefits transfer Social Security benefits Medical records for Medicaid/ Medicare recipients Veteran's benefits,etc.	Legg (1992) Hooper (1992) Wilson (1992)
Electronic Mail (email)	Sending messages electronically using a computer connected to a phone or data network. Email allows communication regardless of place and time.	Ordering government materials Message exchange between government officials and between government officials and constituents Requests for information	Krol (1992) See recent issues of *Electronic Networking: Research, Applications, Policy*
File Transfer	Transfer of computer files between host computers and desktop workstations.	Large document transfer (e.g., manuals, instruction guides, large data files,) IRS Forms and instruction manuals Grant applications and information Legislative documents	Krol (1992) See recent issues of *Electronic Networking: Research, Applications, Policy*

Technology	Description	Service Possibilities	For Further Information
Remote Login (Telnet)	Enables user to log on to a remote host computer and use the services of that computer as if a local user.	Search holdings of Federal libraries, and use publicly available databases of Federal agencies Search directories of government agencies Information dissemination, including minority programs, grant programs, and EPA documents, to name just a few of the hundreds of possibilities	Krol (1992) See recent issues of *Electronic Networking: Research, Applications, Policy*
Electronic Data Interchange	A set of standards that instruct hardware and software to permit computers in separate organizations to transfer documents electronically. The process eliminates intermediate steps necessary for processing paper documents. The operation is performed computer-to-computer.	Medicaid/Medicare forms processing International patent information cooperation Government-wide procurement (extension of DoD)	Wigand (1992) Marion (1992) Baum & Perrit (1991) Wright (1991) WEDI (1992) Schwartz (1992)

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Technology	Description	Service Possibilities	For Further Information
Geographic Information Systems (GIS)	Also referred to as digital cartography, this technology combines map drawing and database management systems. Multimedia links are curently being developed for these systems. Industries such as AAA and Rand McNally have already adopted GIS production systems.	Obvious users include USGS, State Department, and other agencies that constantly update maps.	Bowman (1992) Steinberg (1991) Hamel (1992)
CD-ROM/CD-WORM	A 4.5" laser disc can hold up to 600MB of data. Software interface permits simple and fast access to large quantities of information. CD-ROM does not permit altering of data. CD-WORM permits a one-time write to disc.	Agency rules and regulations Wide distribution of agency databases (e.g., MOCAT, GPO's monthly catalog database) Statutes, court decisions, and other legal information Manuals, applications, forms, etc.	See recent issues of *CD-ROM Librarian*, or *CD-ROM Professional*
Optical Imaging Systems	Use of a computer, high speed scanner, write once optical drive (CD-WORM) and a laser printer to make images of office documents for storage. Search software makes retrieval simple and fast. Replaces paper and microfilm for document storage.	Archives of any sort Record keeping	James (1992) Feretic (1992) Byte (1991)

Technology	Description	Service Possibilities	For Further Information
Fax (Facsimile Transmission)	A fax machine scans a printed page and transmits the image to a receiving fax machine over a telephone line. Group Three and Group Four machines (standards that must be adhered to) are inexpensive and portable.	Time-sensitive information dissemination, including medical, agricultural, and financial data. Fast transfer of applications or forms.	Baerson (1992b)
Executive Information Systems (EIS)	A computer system that delivers, analyzes, and displays information customized for executive needs. Daily reports, flash reports, and information from online sources are a few of the possible services of an EIS. These systems may be developed in-house or purchased from developers.	When an agency is decentralized, the need for an EIS is magnified. Agency heads will be in danger of being out of touch if not informed daily of the operations in the field.	Zurier (1992) McAuliffe & Shamlin (1992) Rockhart & Delong (1988)
Online Databases	Databases function as a central source to make information available in digitized form for diverse applications. An online database enables an end-user to use the database anywhere, anytime, over a telephone line or a network connection such as Internet/NREN.	Information dissemination Document locator services Library catalogs Collaborative projects among agencies, such as the FEDIX service	See recent issues of *Online* or *Database*

Technology	Description	Service Possibilities	For Further Information
Digital Signatures/ Blind Signatures (Electronic Signature & Data Authentication)	NIST has been developing a security standard for an information system to link a unique electronic signature with a user, to ensure that data contained in a document has not been forged or altered. A blind signature encodes a transaction performed using a digital signature, to assure the user that tracking of electronic transactions is not taking place.	Procurement Medicaid/Medicare records, and any other government database where legitimate privacy concerns need to be addressed.	Chaum (1992)
Cable TV/ Interactive TV	Cable TV allows a the public to purchase television programming from sources other than national networks. Cable television promotes local programming and low-cost production efforts. Interactive TV provides a two-way link between the viewer and the television programs, using FM channels and cellular-radio networks.	Government information programming, such as health concerns, grant application instruction, how to obtain government documents, etc. Interactive TV could be developed for convenient, efficient, government services reaching the home.	Antonoff (1992)
Network Resource Discovery Tools	WAIS, Gopher, Archie, and others are a group of software programs or standards developed to assist a network user to handle the enormous amounts of information available on networks.	These are just of few of a diverse set of support tools. One of these tools may be developed to specialize in location of government resources.	*Electronic Networking: Research, Applications, Policy Spring 1992*

Note: Some of the descriptions of information technologies used in this table were taken in part from Keen (1991a).

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III. REDESIGNING INFORMATION RESOURCE MANAGEMENT FOR ELECTRONIC SERVICES DELIVERY

INTRODUCTION

The improved utilization of information is a key solution to the dilemma of how to provide more, better, and more flexible, government services at less cost. Superior management of the government's information resources will be critical to the success of this goal. This section explores ways that a redesigned IRM approach can contribute to better provision of government services in an electronic information era.

The study team began by reviewing IRM's first decade looking for persistent, unresolved, problematic situations and the lessons that might be drawn from the experience. What could be learned that might be of use in the next decade? The heritage from this era is a view of the management and flow of information that is internally focused on the efficiency of key agency operations that are paper-based and product-oriented. This view is epitomized by the title of IRM's enabling legislation, the Paperwork Reduction Act (PRA). For top management, the reduction of paper forms is an obvious way of improving the efficiency of the major internal operations of an agency. But this approach has been inadequate for addressing the larger management concerns of handling increasing amounts of electronic information and connecting IRM to services delivery.

The study team asked managers who are innovative users of information technology (IT) for services delivery (see examples in the preceding section) to help identify key considerations and their policy consequences for IRM in the electronic delivery of government services. The objective was to determine how IRM would have to be redesigned to provide electronic services delivery. The move from paper-based to electronic services; from centralized mainframe to distributed, client server desktop-based computing; and, the orientation toward the effective delivery of services has quietly revolutionized the way information resources are managed.

Using the results from these two approaches, the study team developed a set of critical success factors that must be addressed if IRM is to evolve successfully. This section of the report takes a proactive stance on what, specifically, can be done to redesign IRM to be an effective management strategy in the evolving electronic environment and better respond to the service needs of the Nation's citizens.

A REVIEW OF IRM: FIRST DECADE

In 1974 a temporary national advisory panel, the Commission on Federal Paperwork, was established (88 Stat. 1789) to:

> Study and investigate statutes, policies, rules, regulations, procedures, and practices of the Federal government relating to information gathering, processing, and dissemination, and the management and control of these information activities.

Information resources management as a concept derives from the Commission's 1977 report (Hernon & McClure, 1989). According to the PRA, IRM is "the planning, budgeting, organizing, directing, training, promoting, controlling, and management activities associated with the burden of collection, creation, use, and dissemination of information by agencies, and includes the management of information and related resources such as the automatic data processing equipment." Since its origins in the

Commission's 1977 report, IRM has been used as an umbrella concept to focus debate on how to best manage government information both within Federal agencies and across government using a changing array of information technologies. The debate concerning how to best manage Federal information resources has evolved via a number of policy initiatives, including:

- Laws and Proposed legislation such as:
  - Paperwork Reduction Act (PRA) of 1980 (P.L. 96-511, 44 U.S.C. Ch. 35, 94 Statutes at Large 2812-2826) and its 1986 Amendments (P.L. 99-591, Title VIII, Part A)
  - Brooks Act of 1965 (P.L. 89-306)
  - Privacy Act of 1974 (5 U.S.C. 552a)
  - Computer Security Act of 1987 (P.L. 100-235)
  - Computer Matching and Privacy Protection Act of 1988 (P.L. 100-503) and its amendments of 1990 (P.L. 101-508; 5 U.S.C. 552a, note).
- Multi-agency rules & regulations such as OMB Circular A-130 (Office of Management and Budget, 1985) and proposed revisions (1992) and Federal Information Resources Management Regulations (FIRMR). For a discussion of other OMB Circulars, see Hernon & McClure (1987, pp. 117-136).
- Agency, Government, national, and international standards such as: NASA's Data Interchange Format (DIF), Machine Readable Cataloging (MARC), Federal Information Processing Standards (FIPS), and data retrieval standards such as Z39.50.
- Internal agency policies and procedures.

These will be the levers which must be pulled as IRM is aligned with its new purpose of providing electronic delivery of services.

There has been an active literature in this area assessing the impact of IRM on Federal government information services provision helping to shape the IRM concept including: Hernon & McClure (1987), Sprehe (1987), Caudle & Levitan (1989), and Bishop, Doty, & McClure (1989). IRM has had an impact on state governments, see for example, Caudle & Marchand (1989), and more specifically in Florida, Davies & Hale (1986), and South Carolina, Powers & Williams (1987). IRM has also had an impact internationally; in Canada, see De Jong (1987) and in Germany, see Wigand (1988a, 1987).

The recent history of IRM development has not been trouble-free (Bass & Ploucher, 1989; Caudle, 1988; Hernon & McClure, 1989). Recently, the GSA and OMB convened six study groups consisting of Federal IRM officials, which generated a number of useful recommendations. The Information Technology Association of America's Federal Systems Integration Committee (1992) conducts useful annual surveys of IRM executives. Recent reports outlining government-wide IRM issues have been produced by the GAO (1992d; 1992e). In general, these reports agree that IRM has been technology planning and procurement oriented, with inadequate attention to identifying and meeting a range of agency and public service needs.

The Evolution of the IRM Concept

In examining this literature and the experiences of IRM managers for persistent, unresolved, problematic situations and the lessons that might be drawn from these experiences three themes emerged. They are the ongoing:

- Inability to flexibly transition from one dominant technology to the next
- Need to establish IRM's identity in terms of organizational position, awareness of the importance of IRM concepts, and assurance of accountability within agency and government-wide affairs
- Focus on internal IRM efficiencies often to the detriment of external effectiveness.

Addressing these problematic situations will be essential in the redesign of IRM to deliver government services electronically.

Flexible Transition to New Information Technologies

Government has moved increasingly from management of paper-based information sources to mainframe computers, to microcomputers, to the present distributed, desktop computing era since the PRA began its work. These transitions have been anything but timely or smooth. Government continues to operate in a paper-based mode. For example, it has been unable to determine whether an electronic document is the same as its paper equivalent. Procurement practices leave agency officials complaining of information technology ten years out of date. Agency personnel remain under-trained in the use of technology they have. The Federal government's response has been to patch, fix, and blame. What has gone largely unrecognized is that we have moved from the tangible, product-based world of predictable paper transactions to a less-tangible, process-based, constantly changing, virtual environment.

An early attempt at addressing the process components of IRM was the information life-cycle idea. The information life-cycle consists of a series of value-added (Taylor, 1986) stages encompassing information production, organization, presentation, use, and disposition. It has taken us this long to begin to fathom the consequences of this idea and develop policy to match. The only consistent finding to date is the regularity with which agency planners fail to address end-to-end information life-cycle issues. A great deal of interest has been expended in the related areas of the product and technology life-cycles. As yet there has been no attempt to coordinate these activities.

Federal government, in groping for ways to integrate and leverage these new information technologies has consistently focused on the product and failed to re-engineer the process. Federal government continues to operate as if the introduction of new information technology is a one-time occurrence. Yet the first generation of IRM practice has clearly illustrated that the only constant is change and the only way to capitalize on information technologies promise is to address the process so that effective new products, such as the electronic delivery of government services, can emerge.

Establishing IRM's Identity

The PRA's attempt to insert IRM into the ranks of senior level administration, at both the agency level and government-wide, have largely failed or at best had mixed results. Within many agencies, the senior IRM official has not become part of core agency management. Instead, the IRM office is at best resented, frequently bypassed, or simply ignored. The relationship of the IRM office to other agency units is unclear in many agencies. The ability of IRM officials to plan and coordinate their activities with agency mission has been difficult. The IRM positions in agencies have been viewed, in some instances, by senior managers as places to transfer those who did not work out elsewhere in the organization. As a by-product of this failure to establish an organizational fit, IRM officials have faced an uphill battle in educating senior agency officials and the functional units about the utility of IRM concepts and practices. Sound information management decisions, when they occur, are due to luck or accident rather than design. Systematic training in IRM is rare and incomplete.

The experience at the agency level has been mirrored at agencies that have government-wide responsibility for IRM e.g., OMB-OIRA and GSA. The need for government-wide IRM coordination has been clear from its origin. But who among the agencies should be doing what, with what authority (particularly across the branches of government), was never made explicit in terms of both mandate and funding. The result of this indecision has been a multitude of IRM regulations issued from the top that do not reflect the diversity of agency IRM contexts. Managing this diversity centrally has been difficult, achieving agency accountability has been all but impossible. Systematic training in IRM has not occurred among officials with government-wide IRM responsibility. Government-wide IRM training, when it has been attempted, has been significantly underfunded and incomplete.

Inordinate Focus on Internal IRM Efficiencies

Beginning with the PRA (1980) enabling legislation, IRM has been concerned with increasing internal organization efficiencies. There is general consensus in government now that information is worthy of the same level of attention and management as labor, capital and natural resources. IRM has assisted the Nation by monitoring the paperwork, red tape, and information processing burden on citizen, business, and government alike. There is general belief within government, supported by numerous examples of successful practice, that information is an economic resource and sound information management saves money. In sum, IRM has begun to have an impact on improving organizational efficiency, but at what cost?

The inordinate focus on improving internal agency IRM practice has limited agencies' ability to engage in effective relations with external partners. These partners might be as near as another unit within the same agency, another Federal agency, or other governments and the non-profit and for-profit sectors. For example, despite enabling legislation (PRA , 1980) most agencies do not know what their information assets are due to a lack of agency locators. The opportunity to identify and eliminate duplication of efforts within agency units, and across agencies and to engage in cooperative activities is substantially reduced. As a result, agency use and management of information resources is uneven across government. If you don't know what you have, you don't know what you need.

It has been in the area of external agency/government IRM relations that there has been the greatest unresolved conflict. In the Federal government's IRM relations with the private sector, procurement, outsourcing, ownership of resulting government-private information products, costs, what to charge, are all ongoing issues without effective resolution. In Federal - State (and local) relations state information managers remain unsure whether the Federal government is a partner sharing its vast information resources or a competitor for scarce revenue.

Perhaps the greatest concern has been in Federal IRM's failure to deal effectively with the distribution of its products and services to its users. PRA's "undue burden" clause has stymied agency

IRM officials' ability to evaluate what users need. An effective government distribution mechanism to move Federal government information out to the public is not in place. The pre-existing, largely paper-based, approach has been underfunded, underutilized, and crippled by ambiguous and conflicting directions. It is only recently (1992 revisions to OMB Circular A-130) that agencies responsible for government-wide IRM practice have recognized their responsibility for insuring effective access and dissemination of government information while protecting citizen's rights to privacy.

IRM responsibility for access and dissemination was omitted from the original PRA, but added in the 1986 amendments. The central role of promoting access and dissemination activities has only recently begun to receive the attention it deserves. See for example, OMB's (1992) proposed revisions to Circular A-130 and a recent article by Kadec (1992). EPA officials learned with the publication of the Toxic Release Inventory that information is itself a service which can win new friends among former adversaries of the agency.

O'Brien & Morgan (1991, p. 4) suggest that there are five major components or dimensions that must be successfully managed in order to achieve the objectives of IRM. They are: (1) resource management, (2) technology management, (3) functional management, (4) strategic management, and (5) distributed management. This quick review of IRM's first decade suggests that while some progress has been made in achieving the first three objectives very little has been done to achieve the last two. These two final areas will become critical as the Federal government plans and coordinates the electronic delivery of services.

As we begin the next decade of IRM there is much debate about the appropriateness of IRM and its overall effectiveness in the Federal government. It is also unclear if the existing policy framework for IRM provides adequate guidance for how it should be implemented, especially in the context of services delivery in an electronic age. Indeed, one of the original mandates of the PRA (Section 3501 (5)) was to:

> ensure that automatic data processing and telecommunications technologies are acquired and used by the Federal Government *in a manner which improves services delivery* [authors' emphasis] . . .

Despite this concern to "improve services delivery," IRM's record in this area is mixed at best.

SUCCESSFUL USE OF INFORMATION TECHNOLOGY: IRM CONSIDERATIONS

The study team asked information managers who have spearheaded the use of new information technologies for improved services provision to identify key considerations and their consequences in forging a central role for IRM in Federal government services delivery. Figure 4 summarizes these considerations and consequences. Conspicuously missing from their list was any mention of privacy or security.

Findings from the study team's research suggest that managers view information technology as advancing in terms of capability and potential at a staggering rate, with costs often falling with a corresponding speed. Managers noted the need for continuous re-education to keep up with, let alone effectively use, new information technologies. All managers remarked that firsthand experience and experimentation with these new information technologies improved their ability to make decisions about IT deployment and use. Yet, across the board, few Federal agencies provide compelling motivation and incentives to innovate. There is, with few exceptions, a strong set of innovation disincentives built into agency culture. A climate needs to be created that fosters risk taking and experimentation. Managers in the most successful organizations have struck a balance between the need to innovate with the need to provide ongoing services.

Figure 4
Summary of Key Considerations and Their Consequences for IRM

Consideration	Policy Consequences for IRM
Cost of IT is high and funding is uncertain.	Securing a steady funding stream for innovation is risky when funding is externally controlled. Policymakers must specifically target funds for innovation if they wish to insure its occurrence. A few successful innovations can achieve break-even funding, but a 50 percent failure rate is not uncommon.
As precision in assessing costs increase, our ability to charge remains constant or decreases	Digitization makes it easier to assign costs along a value-chain in a product's life cycle. But it may not be feasible for political or social reasons to do so.
Technology introduction has ecological impacts creating new problems as it solves old ones	Policymakers focus on the technological complexity of new IT and ignore, to their detriment, the social consequences. Can IT impact statements be far off?
IT speeds information processing. This in turn forces the need for more rapid decision making	Policymakers' slow response to IT's challenges to copyright, privacy, and security illustrate the problem. Policymakers do not know the issues, let alone have experience with them.
Decentralizing of technology and organizational structure	While this phenomena is well known, agency managers view the process as largely unpredictable. A key need to address the shifts in power. See for example, Toffler (1990).
Connecting	Like decentralization, technology is forcing/allowing partnering and collaboration where it was previously not possible. At the heart of this process is the need for common standards. Policymakers are often caught unaware.
Information ubiquity	With the continued reduction in size of digital technology, the availability of instant access to high-quality information products and communication services is likely. The opportunity for new citizen services is matched by the need for new organizational structures and new forms of management, such as remote management.

Figure 4 (Continued)
Summary of Key Considerations and Their Consequences for IRM

Consideration	Policy Consequences for IRM
Innovation has become the norm	External drivers such as IT have made organizational change a constant. Yet bureaucratic structures remain rigid and have not evolved.
Scanning for technological improvements has become mandatory	Policymakers can adopt the ostrich approach to technological innovation and become extinct – or they can adapt. Sharing information between agencies often happens by accident rather than by design.
Technostress	The impact of the uncertainty engendered by IT on employees is often unexamined, unacknowledged, and untreated.
Product champions are key There are three types for a given new product: policy, managerial, and technical.	While all three types of product champions are needed they are often discouraged in government. Often a product fails because one of the three types is not present.
Incentives to change	The introduction of new IT is like other change processes. Incentives must be found to encourage product champions and reward good agency and individual practices.
Ignorance of technology remains a significant barrier to deployment and use	Managers note that they could not fully grasp the opportunities and challenges implicit in new IT until they had experience with it. A critical mass of technologically literate personnel is a prerequisite for effective use. IT ignorance at the higher levels of government may have greater negative impact.
Technophoria	At the other extreme, a little bit of knowledge can be dangerous. There is a tendency to see a newly introduced technology as a cure for every ill. A new technology frequently causes its users to forget their common sense. Technology resembles smoke and mirrors.
Technology as superhuman	Policymakers tend to load up a new technology with complex policy requirements that have previously defied human administration. When the IT fails, it is easy to blame the technology, instead of the unreasonable requirements.
Unclear productivity gains	It is difficult to know how well a new technology is doing or is being managed, yet the pressure on policymakers to evaluate with poor measures is great. With a new IT, failure can be as instructive as success. A different reward structure for innovation needs to be found.

Figure 4 (Continued)
Summary of Key Considerations and Their Consequences for IRM

Consideration	Policy Consequences for IRM
Clarity of mission has become critical	The complexity and uncertainty of new IT is driving the need for greater clarity of agency purpose. Policymakers have been reluctant to better define an agency's mission without regard to its political context.
Information is power and power, even when prodded by technology, yields its information control reluctantly	Many agency heads view the move to electronic information as eroding their power base in unpredictable ways. This factor coupled with the general lack of experience with IT and its management makes agency heads very cautious.
Need for top administrative support is essential	The introduction of new technology has succeeded where it has had central management's support and failed where this support has been lacking. The IRM function needs to become part of the core administration of the agency.

Managers uniformly expressed frustration with "being out of the loop," so removed from average citizens and their needs as to be unable to know how to provide successful service. Who are the users of government products and services, anyway? There was general confusion about who managers and their agencies serve. One senior IRM official, commenting on why he believes his agency is under no obligation to disseminate its information to the public, made the statement, "Our mission is to serve Congress." Agency officials are regularly caught in this type of role ambiguity. As bureaucrats, they serve their immediate bosses; as citizens, they desire improved government services for the public. Successful managers of information resources know that effective IRM begins by identifying the users. Successful IRM programs succeed by actively and regularly asking users about their information needs. Evaluation of information resources management programs, therefore, must be based on how effectively and efficiently these user needs are satisfied.

Interviews with Federal IRM officials also demonstrated that there is little, if any, vision for a common information infrastructure available to all Federal agencies to facilitate government services provision. FTS 2000 exists, but few in government view it as a prototype and case study for other types of government-wide information infrastructures. While much discussion has surfaced in recent years concerning a national electronic infrastructure, such as the NREN, many IRM officials have no idea how to get connected to the present Internet, nor what purpose would be served by doing so.

Informed by this range of views on the impact of IT on information policy areas, the study team reviewed the history of IRM to identify key management themes and to determine IRM's critical success factors. An understanding of these factors lends insight into the policy issues surrounding the electronic delivery of government services.

CRITICAL SUCCESS FACTORS IN IRM

The recent experience that successful information managers have had implementing new electronic technologies and the lessons learned from the first generation of Federal IRM suggested that this idea could be harnessed to improve electronic service delivery. The study team asked what then are the critical success factors (Rockart, 1979) that policymakers can influence, to improve information resource management's ability to deliver services over the next five years given the impact of IT and the history of Federal IRM? Figure 5 summarizes the areas where "things must go right." They are derived from the literature, our various data collection efforts, and will be explained in greater detail below.

Figure 5
Critical Success Factors in IRM Redesign

- Requiring clear agency mission statements
- Clarifying the roles and responsibilities of lead information agencies
- Tying privacy and security goals to agency IRM missions
- Preserving privacy and security in the electronic delivery of services
- Encouraging agencies to muster their own internal information resources
- Engaging in a systematic, government-wide IRM training effort
- Procuring state-of-the-art information technology in a timely fashion
- Modernizing the Federal information infrastructure
- Freeing and directing agencies to cultivate partnerships
- Identifying, rewarding, and embedding innovation and experimentation in government
- Mandating user involvement in every phase of the information life cycle

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Requiring Clear Agency Mission Statements

Successful private-sector firms, as well as state and local governments, facing stiff global competition, rapidly changing technology, tight fiscal constraints, and increasingly demanding customers, have learned the importance of defining and articulating who they are, what they do, and where they are going. At the government-wide or agency level of the Federal government, this means a clear mission statement that identifies infrastructure, core business processes, applications, and programmatic intent. This may be called vision with granularity. At the government-wide level there has been some acknowledgment of this need in such diverse actions as the proposed S. 20, "The

Government Performance and Results Act of 1992," and the OMB (1992d) policy letter seeking to define what is "an inherently governmental service."

With a clear mission, the following essential IRM processes become possible:

- Identifying, coordinating, valuing, and de-accessioning agency and government-wide information resources.
- Linking the information life-cycle requirements with the programmatic life cycle of the agency.
- Deriving useful performance measures that indicate to agency and government-wide information planners what to do next, rather than merely apportion blame.
- Developing an IRM plan congruent with and in support of the mission.
- Determining what is infrastructure (needed across multiple domains) and what is application (of interest only to a specific unit).
- Partnering and coordination of functionality, each partner then knowing what is necessary to create a win-win situation.
- Determining the most appropriate programmatic role for the agency to play in the provision of government services, be it service provider, regulator, market maker, monopoly, monitor, catalyst, leader, customer, standards shaper, taxer, competitor, authoritative information provider, disinformation producer, or some other role.
- Determining what to charge for products and services. How to set the fees? For what? How to collect? Who should collect? Who gets the money? Who determines all of the above?

Having a clear mission enables agencies to initiate business-process redesign and re-engineering based on agency priorities and fostered by improvements in newer information technology. With clear goals and objectives in mind the creation of useful performance and productivity measures becomes feasible.

The pace of IT-driven change is so rapid that it has become extremely difficult to evaluate its impact on government or on society at large. This would be of minor concern if the information revolution was not so pervasive. Already, as Eccles (1991) suggests, our traditional measures of evaluating performance are shifting from the financial to the informational. The relevant organizational design questions are becoming: Are there a common interface, flexible information transport, common grammar, and interoperable platforms? Information policymakers need to support research that investigates new measures to evaluate the information management function in government.

What Can Policymakers Do?

When these issues are recognized as a context, there are a number of initiatives in which Federal information policymakers can engage to require clear agency mission statements such as:

- Revisit the proposed S. 20, "The Government Performance and Results Act." Consider the addition of information measures of evaluation to the existing financial measures.

- Re-examine OMB Circular 92-05, Information Resource Management Plans Bulletin.
- As a partial alternative, change OMB Circular A-11 to require agencies to produce a strategic business plan reflecting the changes based on the adoption of new information technology (Davenport and Short, 1990).
- Require that explicit links be made between mission and IRM requirements and capabilities, and between department processes and IRM requirements.
- Require that explicit links be made between department processes and IRM requirements.
- Use the upcoming revision of Circular A-130 to clarify the pricing of information products and services.

The apparent assumption in modern democratic governance that such clarity of purpose is impossible to achieve in a timely yet consensual fashion needs to be vigorously challenged. One essential step is to recognize and support the diversity of Federal agency missions and methods to achieve them rather than seek to impose one uniform policy on all. A useful method for doing this is to clarify the roles and responsibilities of the lead information agencies.

Clarifying the Roles and Responsibilities of Lead Information Agencies

There are two types of lead government-wide information agencies: oversight/advising agencies and government-wide information disseminators. The principal oversight/advising agencies include GSA, GAO, National Archives and Records Administration (NARA), NIST, and OMB-OIRA. The principal government-wide information disseminators include GPO, LC, and NTIS. General issues that must be addressed include the following.

Are Government-Wide Information Mandates Practical?

Can an enforceable, government-wide information management mandate be given to Federal agencies to do anything? If so, what agency (in what branch) should be put in charge of administering the charge? There are major historical, jurisdictional boundaries between the Executive, Legislative, and Judicial branches of government that are being applied uncritically and unsystematically to policies affecting the effective management of information among the different branch agencies of government. There are few vehicles for government-wide information policy planning across branches of government. As a result, there have been few successful initiatives (e.g., FTS 2000). Even within a single branch of government, such as the Executive branch, there is resistance to, and ignorance of, government-wide information policies, regulations, standards, and rules. The size of the Federal government and the diversity of its agencies' missions limits the effectiveness of any government-wide pronouncement.

Is It Possible to Be Both Advisor and Critic at the Same Time?

Congress or the Executive have charged specific agencies or their units to conduct oversight evaluations. For example, GSA might be charged by Congress to investigate a specific agency's IT procurement practices. The same agency or a unit within that oversight agency might have responsibility to advise agencies on the best government information practices or train agency officials in their use. Our discussions with agency information managers and the agencies that provide oversight/advice suggest that this is a difficult, if not impossible, assignment.

GAO is not viewed by agency personnel as the place to turn to for advice when formulating a new information management initiative. Yet the oversight/advising personnel at GAO rightly point out that the agency, by virtue of its government-wide scope, has much to offer in formative as well as summative evaluation practices. When asked to defend its budget allocation, GAO will invariably be forced to emphasize (and budget for) the high-profile discovery of government waste over the equally useful advice to and training of agency information managers seeking assistance.

Is There a Need for a Centralized Government-wide Disseminator Function Today?

Advances in information volume, content, and technology challenge a central information dissemination function in the Federal government. The economy-of-scale argument for centralized printing and distribution of government information has lost its merit with Federal agencies now the size of the largest U.S. commercial enterprises. The idea that there is such a thing as a definable scientific and technical information domain has become untenable in the wake of the explosion of the social sciences and such multidisciplinary areas as energy and environmental studies. Information technologies via client-server and distributed information processing have made it possible for information to reside at multiple, geographically remote locations, yet appear to be part of one seamless information retrieval system. What remains is:

- The public's right to know what its government agencies have published
- The need for the Federal government information to be accessible, available, and affordable
- The information producer's right to recover cost and receive credit.

To date, the Federal government, hampered by confused and overlapping lines of jurisdiction, has chosen not to directly address these issues. Instead, an increasingly unworkable system is alternately patched or crippled by special interests within Congress who lack the power to craft a new government-wide dissemination solution.

How Can the Need for Information Standards Be Met?

The information technology that has made global connectivity possible has also made the need for standards mandatory (Office of Technology Assessment, 1992b). Yet the Federal government's response to this reality appears to lack coordination, offers mixed and sometimes contradictory messages, and provides for little enforcement. One organizational response to the range of standards issues is to develop an enterprise-wide standards program (Ritterbusch, 1990) that includes:

- Identifying needs
    - monitor external motivators for standards
    - keep pace with technology

- Take appropriate action
    - adopt or adapt existing standards
    - prepare new standards
    - assure technical validity

- Distribute and maintain standards
    - updating
    - maintenance

- Implement standards
    - maximize usage
    - mandatory usage
    - ongoing implementation

- Other functions
    - train standards users
    - provide advisory services
    - external liaison
    - monitor activities of external standards organizations.

Until these functions are addressed on a systematic, government-wide basis, a primary issue will be the extent to which standards are used, or even known to the people responsible for implementing information technology.

Legislation such as the Brooks Act and the Computer Security Act give NIST a primary role in the development of government standards -- Federal Information Processing Standards (FIPS). The Department of Defense has responsibility for military standards. In addition, OMB and GSA are involved in standards activities. In fact, however, some agencies develop their own "standards." Thus, the actual roles, responsibilities, and process for information standards development and execution are not clear.

The commitment of the Federal government, as expressed in a variety of policy instruments, to the use of standards in the procurement, adoption, implementation, and use of information technology is clear. The Federal Information Resources Management Regulation (FIRMR) specifies the senior IRM official as having the charge to "implement applicable Government-wide and agency information policies, principles, standards and guidelines with respect to...information technology and other IRM functions" (41 CFR Ch. 201, 1992). The proposed revisions to OMB Circular A-119 (Office of Management and Budget, 1992e, p. 9751) requires that Executive agencies "designate a senior-level official with agency-wide responsibilities as the Standards Executive." The circular is not limited to IT, but the key considerations for the lead information agencies are unaddressed: Who should implement what standards functions for which jurisdictions, and how should they be enforced?

What Can Policymakers Do?

When these issues are recognized as a context, there are a number of initiatives in which Federal information policymakers can engage to clarify the roles and responsibilities of lead information agencies, such as:

- Support initiatives that require these agencies to develop public mission statements with five-year plans.

- Institutionalize and empower the interbranch, interagency working groups (see Partnering section below) that have emerged as a result of the need for immediate answers amidst government's inability to formally ask the questions.

- Clarify the roles and responsibilities of the existing lead information agencies to advise, conduct oversight, and disseminate information on a government-wide basis.

- As part of this clarification process, embed institutional mechanisms to encourage where possible and force when necessary the various parties to constructively engage when external events cause the breakdown of role and responsibility agreements.

- Consider separating into two distinct units the oversight function from the advising and training function. This may be best accomplished by having two separate agencies and encouraging personnel to move freely between them so as to share their experience.

- Train lead information agency policymakers in the use of the information technologies they regulate. Make the lead information agencies models of how IT can be managed correctly.

Perhaps the most needed action is for policymaking bodies to recognize the deeper issues posed by the three questions above and promote research that provides answers (e.g., see Congress, 1990b).

Tying Privacy and Security Goals to Agency IRM Missions

Although privacy and security are integral to the concept of information resources management, in practice they have taken a back seat to paperwork reduction and cost containment. The literature search revealed a disturbing gap between existing policy and actual agency practice, in both areas (Office of Technology Assessment, 1986; Office of Technology Assessment, 1987). The GAO has issued a number of reports (1989c; 1989b; 1990a; 1990b; 1991; 1992a; 1992e) chronicling incidents of unauthorized access to government computer systems, inadequate staff training, and other problems related to non-compliance with the Computer Security Act. The reported problems included, but were not limited to, leaving logged-on data terminals unattended, not changing vendor-supplied passwords, and providing access to records containing personal information protected by the Privacy Act of 1974 to external organizations without knowing their purpose for wanting it.

Many agency officials saw the security and privacy plans required by the Computer Security Act and guided by OMB Bulletin 88-16 as reporting requirements, rather than as management tools (GAO, 1990b, p. 3). In part, this attitude was based on the nature of the feedback agencies received on their plans from NIST and NSA, which "focused...on (1) the plans' conformity with the OMB planning guidance and (2) government-wide guidance (e.g., NIST Federal Information Processing Standards publications) relating to planned security controls" (p. 7).

The focus groups conducted by the study team confirmed that, in many cases, privacy and security are regarded as secondary concerns to the agencies' central mission and are therefore often addressed as an afterthought, if at all. One interviewee, a private citizen whose professional work brings him into contact with a number of Federal and state agencies, expressed the view that agency personnel get so caught up in their enthusiasm and dedication to their programmatic initiatives that the "negative" issues simply do not enter their thinking. More common was the view that agency culture simply does not extend to such concerns.

Privacy

The American public is increasingly becoming concerned about privacy issues. In its most recent annual survey on the topic, released in December 1992, Louis Harris and Associates reports that two-thirds of all Americans believe that computers are a threat to privacy. In light of the thousands of databases maintained by for-profit companies in the private sector, which freely and legally sell information that the public generally considers confidential, it is not surprising that three fourths of the Harris survey respondents believe that they have lost all control over their own personal information and that more than half think that the protection of consumer privacy will get worse by the year 2000 ("Privacy Seen...," 1992).

Since its earliest days, the Federal government has collected personal information about individual citizens, corporations, and organizations. Hernon (1989, p. 249) defines six categories of private information, of which two pertain to the current research:

- Personal information collected about individuals who are not government employees, including both statutorily protected information (such as that collected by the Internal Revenue Service, the Bureau of the Census, and the Social Security Administration) and information that is not so protected. (Presumably, Hernon's use of the word "individuals" includes businesses and other organizations; this broad meaning is intended throughout the rest of this discussion of privacy and security.)

- Personal information relating to government employees (e.g., personnel files and personal correspondence).

As of January 1989, more than 2,000 government records systems, mostly computerized, contained this kind of confidential data (GAO, 1990b). With computerization comes an unprecedented ability to combine and compare data from disparate sources with ease and to thus create detailed profiles of large numbers of individual businesses, households, and individuals. While existing statutes prevent or regulate the sharing of certain kinds confidential data, a number of factors are contributing to the technological ease of such sharing.

Privacy has come to be a highly valued concept in the American consciousness. Defined by Samuel D. Warren and Louis D. Brandeis in their well-known Harvard Law Review article (1890) as "the right of the individual to be left alone," it has become a primary concern in the information age. New technologies, particularly computers used in managing records and in maintaining and searching databases, often facilitate potential invasions of privacy (Bennett, 1992; Flaherty, 1979; Department of Health, Education, and Welfare, 1973; Wigand, Shipley, and Shipley, 1984). When people talk about privacy and the government today, says Robert Ellis Smith (1984, p. iii), they are referring to:

- Minimal data collection

- Accuracy

- The right to see and correct their own records

- Notice before their data is shared with others
- The right to know which data banks exist

While the U.S. Supreme Court itself is divided on just what general rights to privacy Americans have, there is little doubt that when it comes to the government's collection, storage, use, and disclosure of information about individual members of the public, specific rights do exist and are generally accepted as socially desirable. On a Federal level, the Privacy Act of 1974 is the principal piece of legislation protecting those rights.

The eight-point policy statement issued a year ago by the New York State Public Service Commission (1991) strives to protect individual privacy rights in a rapidly changing telecommunications environment, but its requirements apply equally well in the face of any new technology. The eight principles are:

1) Privacy should be recognized explicitly as an issue to be considered in introducing new telecommunications services.

2) The interest in an open network should be recognized in evaluating alternative means for protecting privacy.

3) Companies should educate their customers as to the implications for privacy of the services they offer.

4) People should be permitted to choose among various degrees of privacy protection, with respect to both the outflow of information about themselves and the receipt of incoming intrusions.

5) A telephone company offering a new service that compromised current privacy expectations would be obligated to offer a means of restoring the lost degree of privacy unless it showed good cause for not doing so.

6) Consideration of cost, public policy, economics, and technology all bear on the pricing of privacy features, which must be determined case-by-case.

7) Unless a subscriber grants informed consent, subscriber-specific information generated by the subscriber's use of a telecommunications service should be used only in connection with rendering or billing for that service or for other goods or services requested by the subscriber.

8) Privacy expectations may change over time, requiring, in some instances, changes in telecommunications services. At the same time, changes in telecommunications technology services and markets may lead to changes in customers' privacy expectations.

What is particularly noteworthy about this document, aside from the fact that it exists at all, is that it shifts the burden of privacy to the introducers of technology (Bertot, 1992). The Federal government currently has no equivalent policy statement, beyond the general language of the Privacy Act of 1974 and similar legislation.

Security

Several years ago, a security specialist at a mid-sized Federal agency analyzed the passwords of 1,500 agency employees (Highland, 1990). Given that passwords are the first line of defense against system penetration by unauthorized users, his findings were appalling. Although the agency's system accepted passwords of up to six characters, only 4 percent of the passwords he studied actually contained that many characters; in fact, nearly 90 percent of the 1,500 passwords had three or fewer characters. Worse, every single three-character password, and 70 percent of the roughly 650 two-character passwords, were composed of its owner's initials. But his most incredible finding was that 20 percent of all of the passwords he studied contained only one character, and, of these, almost half -- that is, about 150 of the 1,500 passwords -- used the space bar as the single-character password.

This study was conducted before the Computer Security Act took effect, but the passage of the Act did little to prevent 34 Department of Defense sites attached to the Internet from being successfully penetrated by foreign hackers between April 1990 and May 1991. In his testimony (GAO, 1991) before the Senate Subcommittee on Government Information and Regulation, Jack L. Brock Jr., director of Government Information and Financial Management, GAO/IMTEC, blamed the security breaches on "(1) accounts with easily guessed passwords or no passwords, (2) well-known security holes in computer operating systems, and (3) vendor-supplied accounts -- privileged accounts with well known passwords or no passwords at all that are used for system operation or maintenance" (p. 3).

These common security weaknesses all could have been easily prevented. The fact that they were not indicates a lack of sufficient awareness within the agencies of the risk they posed. The GAO's survey of 85 Federal agencies (1989a) revealed that, by December 1988, 45 had started the training program required by the Computer Security Act, 19 expected to have training programs under way by April 1989, and only 2 had not yet finished planning a training program. The Department of Justice participated in this survey, yet, as recently as February 1992, the GAO found the Drug Enforcement Administration, an agency under the Justice Department, seriously delinquent in its security practices, as this example illustrates (GAO, 1992a, p. 5):

> We found weaknesses in DEA's procedures for controlling access to areas where computer equipment is used. As a result, unauthorized personnel lacking appropriate clearances or a valid "need to know" have direct access to classified information...[C]omputers in each of these offices were often left signed on and unattended, allowing unauthorized individuals access to the data contained in these systems.

Seven months after that report was released, the GAO found the DEA still delinquent in its security practices, citing many of the same kinds of problems as well as additional security violations (GAO, 1992i). Not surprisingly, security training at least one DEA division office consisted of nothing more than having employees read several relevant memos and then sign a statement that they had received security training (p. 18). Moreover, DEA computer security bulletins are not always distributed throughout the agency (pp. 18-19).

Clearly, the training requirements of the Computer Security Act have not uniformly achieved the desired result and other initiatives are needed (Office of Management and Budget, 1992a, pp. III-11-14). Part of the problem may stem from the fact that, according to a recent survey, nearly half of the 150 respondent Federal agencies reported a security budget of $1,000 or less (Computerworld, 1992, December 7). Nevertheless, basic security training and practice does not have to be expensive. As the government moves increasingly in the direction of providing information and services electronically, it becomes more critical than ever that agencies pay greater attention to system and data security. While the guidelines proposed by Kadec (1992) are a good start, they are not sufficient to address the problem. What is needed is a government-wide effort to promote privacy and security awareness.

What Can Policymakers Do?

When these issues are recognized as a context, there are a number of initiatives in which Federal information policymakers can engage to tie privacy and security goals to agency IRM missions, such as:

- Shift agency concern away from meeting reporting requirements and toward fulfilling the spirit of privacy and security policies.
- Improve the quality of privacy and security training programs, and require the participation of all agency staff members who have access to agency information systems, regardless of whether they have explicit IRM responsibilities.
- Establish a set of government-wide guidelines, as the New York Public Service Commission has done, that lay out agencies' specific privacy and security responsibilities.

Privacy and security are a key component of information resources management, and they must be addressed specifically, unequivocally, and effectively. Otherwise, the move to greater electronic delivery of government services, with its concomitant consolidation of government information and increased public access to agency records, will exponentially exacerbate the existing problems.

Preserving Privacy and Security in the Electronic Delivery of Services

The Federal government is clearly moving to provide its services electronically. Such a move is encouraged as a means of delivering government services efficiently, while more effectively meeting constituent needs. Increasingly, the technology-service match is not necessarily a one-to-one relationship; in fact, multiple services are being provided simultaneously through single types of technologies. Two such technologies are individually coded magnetic strip cards and smartcards. In essence, the card is coded with a benefit recipient's entitlements; the recipient then passes the card through a special POS reader to make eligible purchases. Smartcards, with their programmable microchips, provide much greater service potential and versatility than cards with magnetic strips, and they are now being considered for other services as well, such as health care. Health and Human Services Secretary Louis Sullivan has envisioned a future in which each citizen would have a smartcard that could be used to retrieve his or her medical history, record treatments, and submit billing to an insurance company (Gardner, 1992).

The smartcard's potential for electronic service delivery seems nearly boundless. In Oregon, for example, smartcards are being explored as a universal "citizen's card," recording everything from benefits entitlements to library transactions to whatever other public services an individual might use. The programmable chip on a smartcard essentially enables the government to tailor government services to an individual's needs, based on demonstrated interest and/or eligibility.

Technologically, the idea holds much appeal; it provides convenience to the user and streamlines government recordkeeping. Moreover, it would enable government agencies to consolidate both their information and their information systems: Since users of one government service often avail themselves of other government services, smartcard technology could cross agency and government boundaries, thus reducing interagency duplication of efforts, fraud, and administrative expenses.

But smartcard technology gives rise to privacy and security issues (Office of Technology Assessment, 1988c, pp. 14-15). To eliminate waste, duplication, and fraud, it may be necessary to match records held by one agency against those of another. In other words, personal information that was once distributed among a number of agencies may become consolidated into a single profile, raising the specter of Big Brother.

At the same time, concentrating the delivery of several services into a single card increases the risk of fraud in the case of lost or stolen cards. Even if the cards are password-protected, smartcards may potentially facilitate the theft of government services. Including a photograph or signature on the card helps only when there is human intervention in the service delivery; a photograph or signature would be useless, for example, at a fully automated kiosk.

Depending on the specifics of how smartcards are implemented, agency IRM officials will need to pay special attention to their unique characteristics. The very capabilities that make the smartcard such a promising technology also open the door for serious abuse. While government policymakers will need to address this special concern, agency IRM officials need to ensure that privacy and security are not compromised in actual practice.

What Can Policymakers Do?

When these issues are recognized as a context, there are a number of initiatives in which Federal information policymakers can engage to preserve privacy and security in the electronic delivery of services, such as:

- Amend the Computer Matching and Privacy Protection Act of 1988 (5 U.S.C. 552a, note) to expand its coverage to include all interagency matching of information covered by the Privacy Act (5 U.S.C. 552a).
- Predicate the adoption of new technologies upon their ability to meet certain security standards, such as reliable user authentication, to prevent theft and other types of fraud.
- Explore the technological suitability of multilevel-security applications, such as Oracle7, for interagency data consolidation.

Other new technologies may raise challenges similar to those generated by the introduction of smartcards. Policymakers need to develop a clearly articulated set of principles to guide IRM officials in the implementation of these new systems.

Encouraging Agencies To Muster Their Own Internal Information Resources

IRM has had its greatest impact on improving the efficiency of agency information resources management practices. This effort should continue and be refined based on the experiences gained with IRM. Of immediate concern is the need to:

- Address Federal agencies' lack of awareness of their own information products and services by creating agency-wide information-product locators.
- Improve the level of knowledge of information technology at all levels of government. Even understanding the questions, issues, and opportunities, let alone implementing solutions, is not possible without first being exposed to the technology.
- Move IRM principles out from the agency IRM office and into agency central management and program units. Make IRM visible.
- Demand and support the re-engineering of agency business processes made possible by the introduction of new information technologies.
- Control the high costs of information technology and processing while enhancing their utility.

The opportunities to improve government services delivery that new information technologies (such as those discussed in Chapter 2) provide will not bear fruit unless an agency's internal information management practices are in order. Agencies must understand their own information, needs, resources, and plans before they can interact with external partners for mutual gain.

What Can Policymakers Do?

When these issues are recognized as a context, there are a number of initiatives in which Federal information policymakers can engage to muster their own internal resources, including:

- Enforce the requirement to develop agency-wide information/inventory locator systems (McClure, Ryan, & Moen, 1992b).
- Agencies should have fully integrated ADP, office automation, telecommunications, records management, library, FOIA, and public information offices which should be combined under the authority of a senior IRM officer.
- A senior IRM official should be part of an agency's core management team.
- Large expenditures for new IT should not be permitted without a systematic plan for business-process re-engineering.
- Support more strongly such programs as the GSA's 1000 by 2000 effort.
- Address these issues and others in the reauthorization of the PRA that is more aptly titled "The Government-wide Information Management Act."

There are sound short-term political reasons to bypass recalcitrant appointed agency officials and micro-manage an agency unit into existence to address a current concern receiving close public attention. The long-term result, however, is an agency at war with itself, an agency unit ignored or monopolizing scarce agency resources, or an agency in paralysis. IRM offices were created by this process and exist in this environment. If IRM is to work, external initiatives must be directed to core agency management, they must develop a plan, and the senior IRM official must be a part of the core management team.

Engaging in a Systematic, Government-wide, IRM Training Effort

At every data gathering session in which the study team participated, they heard the call for better IRM training. Government IRM leaders perceive themselves and their staff as woefully undertrained. The usual culprits are blamed: technophobia, technostress, technoshock, and even cultural splits along technical lines or even generational lines. The most frequent comment was that "many senior agency officials and IRM chiefs are nearing retirement age, are all GS 13 or higher, and therefore (by definition) technologically illiterate." The study team suggests apportioning blame is irrelevant. All need familiarity with basic IRM principles and basic computer/telecommunications literacy.

Our discussions with government officials has repeatedly demonstrated the need for decision makers familiarity with the technology prior to action on agency deployment of the technology. Yet all to often in the Federal government key government decision makers do not have an appropriate understanding of the technology and how to apply it. Of immediate concern is the need to:

- Train lead information agency personnel, senior agency managers, and program unit heads in basic IRM principles and computer/telecommunications technology literacy. Many of the IRM officials who obtained their position due to administrative ability also need to be trained in the information management and technical aspects of their job.

- Educate all staff members who have access to agency information systems, regardless of whether they have specific IRM responsibilities, about privacy and security issues.

- Assess the specific needs of agency personnel via agency IRM officials and systematically develop a curriculum.

- Attract and retain good personnel. Many of the technically literate implementors of IRM (e.g., programmers, librarians, LAN & WAN administrators) generally, are not paid competitive salaries when compared to the commercial sector.

- Require mandatory continuing education in IRM and information technology/services management.

- Establish formal job description series or career paths for IRM personnel in government.

Training is the first item to be cut in a recession and in fact, many training programs in the government have been hard hit. This is not to say that no training goes on in government. GSA's Trail Boss program and its 1000 by 2000 effort are to be commended. But they tend to be the exception rather than the rule.

What Can Policymakers Do?

When these issues are recognized as a context, there are a number of initiatives in which Federal information policymakers can engage to improve government-wide training, such as:

- Direct the Office of Personnel Management to detail an IRM job description series. Salary scales should be competitive with industry.

- Streamline the process and shorten the time it takes for a government employee to receive approval (with funding) to attend continuing education workshops.

- Find ways to encourage remote, quality, experts and training programs to offer their services in both Washington, D.C. and in the field offices. Government sponsored, fully equipped, conference facilities would reduce costs to the government, reduce long-distance planners frustration, and encourage those previously reluctant to bring their knowledge and expertise to the government.

- Designate a lead agency in this effort, and then empower it to carry out the task. This may require an assessment of whether GSA, which has the obvious charge, is in fact, up to the job. It will require government assessing its own training needs, educating the non-profit and private sectors about those needs, and employing rigorous evaluation criteria.

- Consciously involve the non-profit and commercial sectors in this enterprise.

What is lacking is a systematic, government-wide IRM training effort, which is predictable, sequential, multiyear in dimension, securely funded, and tied to real incentives for job retention and advance.

Procuring State-of-the-Art Information Technology in a Timely Fashion

Today's procurement practices are largely based on the Brooks Act (40 U. S. C. 759). Agencies and IRM organizations may nor procure IT without the expressed and delegated authority of the GSA, i. e. the Delegation of Procurement Authority. The Federal Information Resources Management Regulations (FIRMR) (41 CFR 201) cover these regulations and they address the procurement of hardware, software, maintenance and related services. The GSA administrator grants agencies blanket delegations for those resources where the costs over the life of the contract do not exceed $2.5 million. Exceptions are possible, i.e., agencies can be recognized for "their particular abilities and to provide all Federal agencies the opportunity for the broadest possible blanket procurement authorities."

Recent legislation, i.e., the Federal Property and Administration Services Authorization Act (H. R. 3161), made an attempt to improve the procurement process, but it died in Congress in 1992. It is almost certain that this legislation will be reintroduced in 1993, including a mandate to use some commercial products and to revamp debriefing procedures. OMB had supported a compromise version of H.R. 3161 because it would have enabled OMB's Office of Federal Procurement Policy to test innovative procurement techniques. This latter feature is generally viewed as a most important aspect in streamlining the procurement process overall.

Virtually everyone agrees that it is essential that the procurement process for information technology must be carried out in a timely and speedy fashion. This, however, is almost impossible when one considers the formal and time-consuming bidding process. Often the technology itself has been improved upon by the time the bidding information can be released.

What Can Policymakers Do?

The procurement issues are critical, and there are a range of strategies that might be considered to improve the process:

- Provide mechanisms within the legal and administrative framework making possible innovative procurement techniques and procedures
- Tailor the procurement process such that the newest and most appropriate IT can be acquired
- Speed up the procurement process
- Streamline the debriefing processes
- Make post-award debriefings mandatory as one means for avoiding lengthy and costly protests
- Make procurement criteria more explicit.

These efforts will not be easy to accomplish, but they are absolutely essential if the procurement process is to be improved. The current procurement process for the acquisition of IT and related technologies and services often times serves as one of the most significant barriers in developing and deploying a modern information infrastructure.

Modernizing the Federal Information Infrastructure

There is increasing consensus that there are some aspects of the Federal government information processes that are best handled on a government-wide basis. The problems cannot be addressed by an individual agency alone; the solutions demand that agencies work together. The benefits can be achieved only if all have a shared vision, timetable, set of expectations, and outcomes. In other words, there is a need to modernize the Federal government's information infrastructure. Information infrastructure, according to Weill (1992b, p. 8), is the base foundation of IT capability budgeted for and provided by the information systems function and shared across multiple business units or functional areas. Information infrastructure consists of both the technical and the managerial expertise required to provide reliable services and has the following characteristics.

Background

Information infrastructure must be seen as vital, the foundation upon which multiple agencies and jurisdictions can build (Weill, 1992b, p. 1). Agency officials were quite clear that the electronic delivery of services would not happen if an inadequate information infrastructure existed. The infrastructure supplies a technological platform to enable other government functions to be produced. See Weill (1992b), Ahituv & Neumann (1990), and McKay & Brockway (1989).

Infrastructure is seen as an expense to be paid for by a central authority as a necessary cost of doing business, with costs usually assessed via tax or user fee. McKay & Brockway (1989) estimate that IT infrastructure accounts for between 35 percent and 40 percent of total IT investment in the average firm. Financing infrastructure improvement is a major undertaking. On the other hand, there are a number of historical examples of effective infrastructure development. An instructive example of more recent vintage is the Zellers approach as documented by Wrightman (1990). Zellers tied funding of infrastructure to income from major business process improvement. Weill (1992b, p. 16) notes: "The right amount of investment is a delicate balance...Too little will lead to duplication, incompatibility, and non-optimal use of resources. Too much will discourage user investment and involvement and may result in unused capacity.

There are a number of documented benefits of information infrastructures building based on industry experience and the development of state-wide networks, including:

- Supports coordination of functions. See Galbraith (1973), Malone, Yates & Benjamin (1987)

- Promotes national improvements in productivity (Aschauer, 1989), industry improvements (Keeler & Ying, 1988), manufacturing output (Deno, 1988), and labor productivity (Munnell, 1990)

- Encourages customization at the local level--frequent changes in business process can be made without changing the infrastructure--and puts ability to respond to external environment where it is most likely to be sensed

- Depends on view of information infrastructure

- Helps avoid the consequences of not investing.

Other benefits are less easily measured, intangible, and long-term. A principal benefit of infrastructure is simply that it enables applications not previously possible.

Information infrastructure implies more than technology. Turnbull (1991) notes it includes the hardware, operating software, communications, and other equipment and support required to enable business applications. Earl (1989) adds the applications that result from the infrastructure's computing and data communications. Infrastructure involves standards and their development. Infrastructure also includes Itami's (1987) "invisible assets" in the form of bodies of knowledge, skill sets, and experience. See also McKay & Brockway (1989). Infrastructure changes the social context as well as the technological environment. Keen (1991b) suggests that infrastructure is best described in terms of its range (locations that can be reached from the desktop to around the world) and reach (the type of information exchanged, bandwidth, and interoperability).

Keys to Success

Pritchard & Karasick (1973) and Weill (1990b), in examining factors essential to successful infrastructure deployment in a business, suggest four keys to success: top management commitment, previous experience with IT, user satisfaction with the new capabilities afforded by the infrastructure, and the internal political turbulence of the firm. Clemons (1991) suggests seven lessons decision makers should consider when determining whether to build IT infrastructure:

- Rank alternative courses of action

- Work with the numbers you have and compute alternatives

- Balance the many forms of risk

- Actively manage the risk

- Leverage your key non-technical resources not readily available to competitors

- When, as is likely, sustainable competitive advantage is not likely, consider cooperation

- Do not forget the downside - keep future strategic options open

Senn (1992) stresses the importance of keeping focused on the potential that infrastructure can bring "real" competitive advantage.

Venkatraman (1991) suggests that how one views the role of information infrastructure determines how it is built and paid for, and if it succeeds. If infrastructure's role is viewed as:

- Independent, then development takes place outside the strategic context. Information is a utility and is treated as an expense.

- Reactive, then development is in response to an internal or external strategic stimulus. Infrastructure planning is a by-product of business plans and is viewed as a business expense.

- Interdependent, then information infrastructure is constantly aligned with strategic context. Changes in infrastructure signal changes in strategies and vice versa. Infrastructure is viewed as a business investment.

Information infrastructure planning and implementation will force shared vision and focus scarce resources (Weill, 1992b, p. 28; Tushman & Nadler, 1978). As Peter Drucker (1992, p. 90) notes:

> Therefore we come back to the old -- and never resolved -- problem of the pluralistic society: Who takes care of the Common Good? Who defines it? Who balances the separate and often competing goals and values of society's institutions? Who makes the trade-off decisions and on what basis should they be made? .... The challenge that faces us now ... in free-market democracies such as the United States, is to make the pluralism of autonomous, knowledge-based organizations respond both to economic performance and to political and social cohesion.

The study team discusses recommendations for the Federal government's infrastructure modernization in Section VI.

Freeing and Directing Agencies to Cultivate Partnerships

The high costs of information technology, the national budget deficit and strained economy, globalization and the end of the cold war, the advent of client-server and distributed information technologies, and the increased recognition of the need for shared purpose in the face of great complexity are some of the key drivers encouraging partnerships and infrastructure building. There are different types and levels of partnerships, beginning with units within agencies, among agencies, between Federal agencies and state and local governments, between Federal agencies and the non-profit and private sectors, and between the Federal government and foreign governments and international agencies. What must be done?

- Create partnerships throughout organizational units, across agencies, and across governments that respect and support each other's missions

- Address Federal agency lack of awareness of other agencies' related information products and services

- Understand and address citizen, government, and private-sector concerns when government-industry development of information products and services is being considered

- Determine when to outsource, for what purpose, and who owns and controls the resulting product

- Define the nature and procedures for agency versus government-wide information planning and management. How are they similar, how are they different?

- Move Federal services out to citizens using existing state and local government distribution mechanisms in win-win arrangements

- Explore the role of the non-profit sector in the creation and distribution of government information products and services

- Determine what the appropriate relationships with foreign governments and other international organizations are in the area of information management and government services delivery

- Clarify the roles each participating unit plays in services delivery.

Partnering is essential. Federal IRM officials have been fostering this process informally for years in such groupings as FIRMPOC, Federal Library Information Center Committee (FLICC), Association for Federal Information Resources Managers (AFIRM), and the Solomon Island's group (Kadec, 1992). The organization SIGCAT supporting the diffusion of CD-ROM use and JEdi project (Speed, 1992), are useful examples to emulate. CIDS illustrates the feasibility of multi-agency re-use of software. The global warming initiative illustrates that multi-agency partnerships are possible and successful at the Federal level.

What Can Policymakers Do?

When these issues are recognized as a context, there are a number of initiatives in which Federal information policymakers can engage to encourage partnering:

- Enforce the requirement to develop agency-wide locators (McClure, Ryan, & Moen, 1992b). Effective partnering can only begin when one has one's own house in order. Locator creation is a useful first step in this process.

- Institutionalize and empower the interbranch, interagency working groups that have emerged as a result of the need for immediate answers amidst government's inability to formally ask the questions.

- Develop guidelines for agency information managers to assist them in understanding the issues to be considered when outsourcing the development of products and services (Office of Management and Budget, 1992a, pp. III-39-46). This should be seen as a necessary extension to OMB Policy Letter 92-1, "Inherently Governmental Functions" (Office of Management and Budget, 1992d).

- Consider legislation that allows temporary suspension of existing rules and regulations to allow agencies and others to experiment jointly with new forms of partnering. Then review existing regulations in light of the results of the experiment.

- Incorporate into new legislation opportunities that encourage where possible and compels where necessary agencies to collaborate on the maintenance or enhancement of old levels of government service or the creation of new services in the context of existing or reduced budgets.

One critical partnership that must be strengthened is that among the branches and agencies within the government. Another is to promote relationships between Federal, State and local government. A third is between the Federal government and not-for-profit and for-profit organizations. But the most critical partnership remains that between the Federal government and the American people.

Identifying, Rewarding, and Embedding Innovation and Experimentation in Government

Adherence to rules and regulations may make efficient government operation possible. But at the same time, particularly when there is a great deal of internal or external environmental uncertainty, there is a need to promote experimentation and innovation and capitalize on both their successes and failures. Both standards and innovation must co-exist in the modern organization or agency. The decision about what to standardize, when to participate in the process, how to develop standards, and whose view to support can be made only based on the experience gained, and with the help of the product champions that emerge from agency-supported experimentation and innovation.

While much is known about the innovation and standardization processes, less is known about supporting both simultaneously in the same agency or organizational unit. More needs to be known about integrating pilot projects' successes and failures into successful agency practice. Some issues that must be addressed include:

- Improving quality in the personnel who seek IRM positions (particularly at the entry level) and increasing the IRM employee retention rate.
- A mitigating factor in innovation is the ability to attract and retain trained staff; experienced staff can avoid re-inventing the wheel.
- Developing parallel but different incentive structures for those who maintain high-quality existing government services and those who experiment with new innovative practice within an organization. High-quality personnel of both types are needed, and both need to be rewarded.
- Meeting the need to regulate experimentation differently from standard operating procedure.
- Articulating the balance between standards and innovation in the organization's mission statement.
- Finding scarce resources to seed pilot projects.
- Not punishing failure, and admitting when something has failed (i.e., terminating its funding).
- Creating the capacity to identify and diffuse good innovative practice rapidly.
- Learning from failure rather than blaming the guilty.

A key to this final issue is to cultivate life-long learning by building and retaining continuing education funding in the face of retrenchment. Information managers, unlike their counterparts in other areas of management, do not have much data or historical practice upon which to base decisions. IRM remains an emerging field. The need for rigorous experimentation here is far greater than in other areas.

What Can Policymakers Do?

When these issues are recognized as a context, there are a number of initiatives in which Federal information policymakers can engage to identify, reward, and embed innovation and experimentation in government, including:

- Consider legislation that creates "enterprise zones" of experimentation within government agencies, free of existing regulation, patterned after private industry (e.g., see American Express' experience in Ditlea, 1992), and funded from existing monies in a manner similar to the VA's Corporate Capital Investment Fund. For a similar funding approach in the non-profit area see Campbell (1992). Provide additional incentives if the experiment or pilot involves external partners

- Charge a lead information agency with systematically documenting, evaluating, and disseminating widely throughout government the results of these agency experiments, both the successes and the failures

- Offer government-wide and agency-wide competitive innovation grants, reward those that partner with other agencies, governments, non-profits or for-profits

- Insist that agencies have a systematic plan to address changes due to information technologies that address the social as well as technical impacts as part of the agencies' mission statements and five-year plans

- Address through the budgetary process the tendency for agencies to cut training budgets first

- Insist that continuing, measurable education and training be built into job descriptions of Federal personnel.

This final initiative is particularly critical in the IRM area. Boyle (1986/1987) notes the difficulty of supporting government-wide IRM training due to the constant evolution of the IRM idea, the change in information technology, the variety of IRM implementation strategies, diversity of agency structures, and job settings.

Mandating User Involvement in Every Phase of the Information Life Cycle

At present, there is an extraordinary distance between average citizens and their Federal government – voter apathy is high, and dissatisfaction with government services is the rule. But who in the Federal government asks its citizen users what their needs are? Who negotiates the creation of products and services to meet citizens' needs within budgetary constraints? Who in the Federal government rigorously evaluates the resulting products and services to discover whether they met citizens' needs? What are agency officials giving the citizen in return for their investments in this area? Could it be that these efforts might improve the citizen's view of their government by giving them the feeling that they owned their government again? In sum, the Federal government lacks a service mentality.

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Encouraging the various agencies to focus on who their users are during the various stages of the value-adding process, be it the approach suggested by Porter (1985) or by Taylor (1986), may take another decade. At the same time, IRM should create an environment that fosters meaningful interaction between the Federal service provider and the producer/consumer/user. The study team is encouraged by such efforts as the "Service to the Citizens" concept (McDonough & Buckholtz, 1992), however. When agencies realize that the public, the taxpayers, the end-users, the creators and producers of agency information are the agencies' chief partners, such issues as access and dissemination will be redefined into questions of equity, privacy, public utility, accountability, and productivity.

What Can Policymakers Do?

Information policymakers need to find ways to bring the users and those who pay for government back into the feedback loop. Some possible steps to take include the following:

- Obtain user input in the *design* of the information product or service
- Modify the "undue burden" clause of the PRA that acts as an inhibitor for agencies to survey the users of their information products and services
- Include mechanisms in electronic services that allow users to leave messages, assessments, and offer suggestions for improving the service
- Create user advisory committees to provide regular assessment of products and services
- Require that electronic products and services be evaluated regularly.

For these steps to be effective, agencies must first believe that user-based assessments and reviews will contribute to the success of their services. This requires a customer and service-based approach within the agency.

SEIZE THE MOMENT

As Taylor (1985, p. 55) points out, the "IRM planning process asks some rather fundamental questions about (1) organizational objectives and directions; (2) investment in expensive information resources, people, and systems; (3) accountability for information resources; (4) access to information; and (5) centralization and autonomy." A recent effort, Corporate Information Management (CIM) has captured the attention of information managers because of its thoughtful design and its massive scope.

CIM is an initiative within the Department of Defense to increase military effectiveness while meeting functional cost reduction targets of the Secretary of Defense's July 1989 Defense Management Report to the President (Strassmann, 1992). Largely, the effort is to be accomplished by facilitating business process improvements, including the deployment if IT. The Department of Defense budget authority will be reduced by four percent per year for FY 1993 through FY 1997. Ongoing Defense Management Report initiatives are expected to reap $70 billion in savings in efficiency and productivity improvements by FY 1997. Out of $70 billion, about $36 billion is tied into the ability of IT to support the changed work patterns of the Department of Defense. About $6 billion out of the $36 billion reduction is to be achieved purely through improvements in the efficiency of IT. The rest of the

$36 billion involves improvements in the delivery of mission capabilities and efficiencies. The 1993 budget for IT alone amounts to over $9 billion (Strassmann, 1992).

A cornerstone of the CIM initiative is the use of functional economic analyses to support management decisions. Considerable similarities can already be seen in the CIM approach and earlier Strassmann thinking (1990, 1985). Paul A. Strassmann, as director of Defense Information and chief architect of CIM, stated that no ongoing project would receive FY 1992 funding unless it was justified by a detailed functional business analysis. These analyses are to clearly demonstrate that a proposed system would improve operations and save money within a functional area, such as logistics. Next, these analyses are used to evaluate the military services's ongoing projects, select the most promising systems, and curtail the others.

Competition among multiple systems for scarce resources to solve single functional problems is being replaced by the examination of the underlying functional processes and their resource implications. Under the CIM initiative the technique and term "business process improvement" is used to achieve functional improvements. Business process improvement has been used successfully in the private sector to eliminate non-value-added steps in manufacturing, delivery, and management processes. Last, the CIM initiative operates on a "fee-for-service" basis which allows functional managers to have visible cost drivers. This also provides flexibility and incentives to manage these costs through modifying demand or seeking alternative sources of supply.

The massive CIM effort has created a considerable momentum and interest among IRM officials. In spite of declining defense budgets, CIM is moving full speed ahead with its plans. CIM has also garnered its share of critics and skeptics within the Department of Defense, the GAO (1992f), the Congress and other entities within the Federal government. As an IRM effort though even critics must admit that Mr. Strassmann has seized the moment politically and organizationally to push his initiatives and IRM philosophies and institutionalized them par excellence.

IRM has always been an evolutionary concept driven by technology and re-directed by political exigency, one part strategic vision, one part tactical policy. This section has argued that the time is ripe to seize the moment and review the founding principles of IRM and reassess them as we enter IRM's second decade. If IRM is to play a central role in the electronic provision of services it will need to shift its focus from internal product efficiency to external process effectiveness. The critical success factors identified here represent a place to begin the process of redesigning Federal IRM for its new purpose. The next section offers examples of potential alternative models based on attempts by state and local governments to redesign information management techniques to support their service needs.

IV. SUCCESSFUL STATE AND LOCAL PRACTICES IN ELECTRONIC SERVICES DELIVERY

INTRODUCTION

Federal, state, county, and local governments receive their mandates from, and provide services to, their constituents. While the activity of service delivery becomes more policy and directive oriented as one moves from municipal governments to the Federal government, all levels of government work to dispense defined government services within their respective jurisdictions. In general, the Federal government generates a policy that has service implications, and the state, county, and local governments frequently carry out the program.

Government services are fostered through collaboration -- collaboration within levels of government, between levels of government, and, increasingly, between levels of government and the private sector. One example of this collaborative provision of services is air travel. Flying in the United States is a joint venture between the Federal, state, county, and municipal governments as well as the private sector. The Federal government provides oversight and management of the air travel process through the Federal Aviation Administration (FAA), while state and local governments physically operate and maintain the airports throughout the country (ownership of airports generally rests with county and municipal governments). The private airlines utilize the airports, for which they are charged user fees. More and more, however, airlines are sharing the costs of airport enhancements. Without such an elaborate collaborative mechanism in place, air travel in this country would surely not function as it does. Rather, there would potentially exist 50 different sets of air travel rules and regulations, thus making interstate and international air travel exceptionally difficult.

Two other examples of cooperative service provision that shall be discussed in detail throughout this section are food stamps (provided through the United States Department of Agriculture [USDA]) and Medicaid/Medicare (provided through Health and Human Services [HHS]). The food stamp and Medicaid/Medicare programs rely heavily on interaction between the Federal, state, county, and local governments and the private sector. The collaborative services model raises several policy questions:

- What are the appropriate roles of the Federal, state, county, and local governments in the provision of government services, and how do the private and non-profit sectors fit into the government services equation?
- What policy and management frameworks exist at the state, county, and local government levels that guide the provision of government services?
- How are service provision effectiveness, efficiency, and productivity, including the satisfaction of services recipients, measured?
- What role does IT play in constituent service provision?

Overall, as the functions, operations, and needs for greater collaboration between governments grow with simultaneously decreasing budget allocations, governments have increasingly relied on and invested heavily in IT to assist them in meeting their requirements (Corbin, 1992). Further, state and local governments are increasingly partnering with the private sector to generate and implement more innovative and cost effective ways of providing services to their constituents (Public Technology Inc., 1992).

At the Federal level, the Office of Management and Budget estimates that the Federal government will spend $25.4 billion on IT in fiscal year 1993, $15.9 billion of which is non-military spending (Office of Management and Budget, 1992b). Meanwhile, it is estimated that states spent $11.33 billion in fiscal year 1989 on IT (Caudle and Marchand, 1989), and it is estimated that county governments spent $23.38 billion on IT in fiscal year 1991 (Fletcher et al., 1992). Clearly, governments are investing tremendous amounts of capital in IT. The questions ultimately become: To what use is all of this technology being put? Is its use coordinated within some overall management framework? Perhaps most importantly, does all this installed technology lead to increased service provision?

This section discusses how Federal, state, county, and local governments and the private sector can and do collaborate in attempts to provide efficient and effective government services. Moreover, the section reviews elements of state, county, and local government information management frameworks, which incorporate IT. These examples present various state and local government initiatives intended to tackle the service/technology/constituent need triad. It also discusses management models that allow services, technologies, and constituent needs to successfully coexist.

INFORMATION MANAGEMENT AND THE MANAGEMENT OF INFORMATION RESOURCES

Prior to providing effective and efficient government services, governments must know what information and information resources they possess. Therefore, before initiating any services, governments must perform the equivalent of an internal information audit and determine their current information holdings, available resources, and future requirements. This audit allows governments to assess clearly their resources and needs, and develop an overall information policy framework.

This information policy framework must incorporate government use of IT. There is no question that governments possess great quantities of IT. This is evidenced through the amount of money being spent on IT at all levels of government. More importantly, few brakes are being applied to the purchase of IT. Rather, governments continue to invest heavily in IT (Corbin, 1992; Fletcher et al., 1992; Caudle et al., 1989). As such, IT is an essential component addressed by information policy, and IT must be managed to be an effective component of constituent service provision.

State, county, and local governments have discovered that the key to good government service provision is indeed good information management cast in an overall information policy. The following sections describe examples of state and county government information policies.

State Governments

Over the last decade, state governments have received fewer Federal funds with which to provide constituent services, and yet, have had greater service provision demands placed on them. In essence, state governments have had to provide more with less. This predicament has caused states to reassess and re-organize their service management and policy frameworks to enhance constituent service provision while operating more efficiently. Below are some examples of state government approaches to the more service-less revenue problem.

South Carolina

The state of South Carolina has initiated a state-wide information policy that provides the following (Powers and Williams, 1987, p. 39):

1) Interagency and intergovernmental information sharing

2) Shared administrative support systems for functions such as personnel, procurement, and financial management

3) Increasing reliance on the private sector to provide information services

4) Instituting life cycle cost controls for acquiring IT.

The above policies provide a framework for agency-related IRM planning along three dimensions: information management, information systems and technology management, and reliance on the private sector (Powers and Williams, 1987, pp. 39-42).

Information management policies in South Carolina focus on issues such as: **public records**, where access to records is the main focus; **records management**, where issues pertain to record retention, storage and retrieval, and paperwork reduction through forms management; **full cost accounting** of information resources, where information management expenditure tracking is a key issue; **data resource sharing** between agencies, where the main focus is reducing data redundancy; and **IRM planning**, where the focus is on the establishment of information management priorities.

Information systems and technology management policies are, in part, concerned with the ability of South Carolina's agencies to: **share data communications facilities** and use information processing capacities efficiently and effectively, which allows for the reduction of duplicated resources without central control of information resources (in fact, South Carolina has seven large departmental networks which feed through the Division of Information Resources Management's processing center; see Caudle and Marchand, 1989); **develop state-wide technical standards**, which allows for the interoperability of state information systems; and, use **up-to-date technology**, to allow for innovation and enhanced service to users.

South Carolina's reliance on the private sector has three purposes: to **introduce competition**, which increases government innovation and productivity; to **reduce the growth rate of the government workforce**; and to force state government managers to **define their work performance standards and justify information technology purchases**.

South Carolina has labored to generate a comprehensive state-wide information policy. This policy (Powers and Williams, 1987, p. 43):

- Links agency and state government strategic business planning more closely with information resource planning
- Uses information more effectively through intragovernmental and intergovernmental sharing arrangements
- Uses information more effectively for government decision making by implementing management practices that help managers find, access, and use information that is compiled in an accurate and consistent manner
- Improves the state's overall return on its investment in information resources by reducing duplication of resources, improving the government's ability to monitor government payments

and revenues, and improving the quality of information available to government decision makers.

These principles offer one approach for deploying and managing government technology.

Texas

The Texas government recognizes that the principal goal of government is to "provide efficient, effective programs and services to the citizens of Texas (State of Texas, 1991, p. 4). To this end, the Texas Department of Information Resources (DIR), through the auspices of the Texas legislature established the Blue Ribbon Task Force on Technology in 1991. This task force was convened specifically to analyze and discuss strategic technology issues facing the state, and was comprised of private sector executives, as well as representatives from the General Accounting Office, the U.S. Army, and the National Institute of Standards and Technology. This task force, in conjunction with the DIR, operates under the following seven guiding principles (State of Texas, 1991, p. 3):

- Provide state-level support for the effective long-term use of IT
- Prepare the statewide telecommunications network to support strategic uses of IT
- Take advantage of shared resources: data integration, common software, and geographic information systems
- Adopt standards and guidelines to ensure necessary connectivity among state IT facilities
- Enable cost-effective acquisition of IT for maximum benefit to state service delivery
- Improve the state's ability to recruit and retain qualified IT personnel and
- Provide for the continuous availability of state information processing capabilities.

The Texas plan is mission oriented. That is, government goals and objectives drive individual agency operations, and the consolidation and integration of services as well as technology is sought where it is feasible. More importantly, the DIR has the ability to coordinate, guide, and oversee agency information management efforts, including IT purchases, implementations, and operations.

Minnesota

Minnesota has established the Minnesota Management Principles. These Principles focus on several major areas (Caudle and Marchand, 1989, p. 49):

- Management Principle: Information systems, like other important resources such as personnel and budget, are fundamental management responsibilities which should not be merely delegated to operations staff. An information system should reflect and support an organization's mission and functions.
- People Principle: The purpose of information management systems is to provide information to people in an organized manner that will assist them in making decisions.

- Data Principle: All data collected, generated, and used by state government must be treated as a resource of the state to be managed and shared across organizational lines. Data must be considered from a much broader perspective than the immediate uses for which it is collected. Data is used for setting strategic direction, for ongoing management, and for operations.

- Standards Principle: In managing state data, just as in managing state finances, personnel, and buildings, the state must function as a common community that needs and wants to cooperate for mutual benefit. The components of information management to be managed and used must be integrated in a way that supports the necessary linkages among state agencies and between state and local governments.

Such principles are an excellent starting point for integrating IT with information technology management.

Virginia

In the Commonwealth of Virginia, information management is conceptualized as follows (Caudle and Marchand, 1989, p. 50):

- Managing information resources: The ability to manage, control, and budget for complex IT resources is based upon the availability of a well-developed information resources plan. An effective agency plan requires a business plan that is tied to an agency's or institution's mission.

- Information security: Information is a valuable asset that must be safeguarded. An effective information security program is necessary to identify and limit those who have access information systems, to maintain a high degree of integrity and accuracy of information, pro the information from disasters, and recover from a disaster should one occur.

- Centralized, decentralized, and distributed processing: The Commonwealth needs to develop a state-wide strategy to make computing resources available at the point where and when information can be most effectively and efficiently processed through an effective mix of centralized, decentralized, and distributed computing.

- Telecommunications networks: A well-designed network is a key ingredient in developing effective centralized/decentralized/distributed computing strategies.

- Information exchange: Good information management practices attempt to share data resident in multiple systems. Virginia's strategy is one which develops common data element descriptions wherever possible, and decreases the costs of redundant systems that store, process, and retrieve the same information.

- State-wide budgeting priorities: The executive and legislative branches of government could better allocate financial resources for IT objectives if they were informed of the "business case" for each new investment.

This approach identifies six key factors that the state sees as essential in the management of information technologies. It is interesting to note that many of these can serve as objectives for developing IT plans.

Kentucky

In 1986, Kentucky adopted basic IRM principles for the purpose of future strategic planning. The principles are (Caudle and Marchand, 1989, p. 50):

- Government information is a valuable resource that has been entrusted to public officials, and it should be managed as such
- State information value lies in its application, and, as such, information should be created or collected only to the extent that it has practical use in fulfilling the agency's mission
- The public has a right of access to governmental information, but that right of access must be balanced by the individual's right to privacy
- Procurement of new IT should take into account compatibility issues with existing systems
- Information resources are managed for the good of the Commonwealth as a whole and the public at large.

An overview of the principles developed by Kentucky and the other states reviewed here provides guidance and suggestions for Federal agencies planning for the delivery of electronic services.

County Governments

County governments are the fastest growing forms of government today, both in terms of population increases and in terms of Federally mandated service provision (Fletcher et al., 1992). Further, county governments are often the primary providers of constituent services. The combination of increased Federal and state mandates, increased populations, increased constituent demands for services, and a decreasing supply of available revenue has forced county governments to rethink, plan, and innovate in their provision of services. County government service provision increasingly relies on the use of IT.

County governments are reacting to the need for more effective and efficient service provision within an overall information policy framework in several ways. Two forms of county government reaction are (Fletcher et al., 1992, p. 8): **strategic restructuring**, where business strategies and organizational structures are being redesigned to enhance services and improve productivity and customer satisfaction; and **work process redesign**, where automation is viewed as a means to re-engineer the operation of a service, rather than a simple duplication of existing processes.

Moreover, as county governments deploy these strategies, they are enumerating explicit strategic objectives that serve to align the redesign and restructuring processes with county missions, and provide a framework for overall IT management. Many county governments view IT as a strategic asset to improve service quality, allow for efficient administrative control of resources, and provide cost savings (Fletcher et al., p. 179).

What Does an Information Policy Allow State and County Governments to Do?

The discussion, creation, and subsequent implementation of a state-wide and/or county-wide information policy are not easy tasks. Policymakers face political, philosophical, and programmatic roadblocks that impede the information policy process. However, many states and counties have persevered and created more comprehensive and unified information policies. Powers and Williams (1987) state that at least one incentive for agency adherence to South Carolina's information management policies is a more efficient and effective use of agency funds. The authors argue that enhanced management of information resources leads to decreased duplication and inefficiencies, which in turn lead to greater funds for other agency programs. Further, government-wide sharing of data and applications is enhanced through the adoption of technology standards. This assessment is echoed by the Texas Department of Information Resources.

Also, state and county governments, through appropriate policy initiatives and goals, are better overall information managers and thus able to perform more "steering" (Osborne and Gaebler, 1992) of intragovernmental, intergovernmental, and government-private services and information processes. This steering process is more effective than "rowing," where states and counties simply provide services without any regard to strategic objectives.

Further, government-wide information policies enable state and county governments to:

- Create strategic objectives and align government operations with those objectives
- Integrate functions across agencies and reduce the duplication of effort, leading to administrative and service provision cost reductions
- Know all their resources, and more easily determine which to deploy and in what quantity for particular service needs. This includes an enhanced ability to determine whether a service should be the sole responsibility of government or part of a joint public-private venture
- Be more responsive to constituent demands through fewer information delivery channels
- Foster public service creativity and innovation, particularly in the use of IT for the purpose of constituent service provision.

Clearly, the advantages of government-wide information policies are substantial. Government, with effective policies, can better manage and deploy its resources, which in turn leads to both enhanced constituent services and greater government efficiency. The state and local government experiences indicate that the road to across-government strategic initiatives is not simple; however, if successful, the payoffs can be tremendous. The Federal government needs to be more active in its creation of such policies and initiatives in order to enter more effectively the electronic service delivery era.

FROM INFORMATION MANAGEMENT TO SERVICE PROVISION

A crucial component to the provision of government services, in general, is the efficient management of government information. Appropriate and effective government services must be preceded by government managing its information resources -- no information resource management, no efficient and effective service delivery. This argument is critical as policymakers introduce IT into the service equation. Governments must manage all of their previously existing resources, to include rapidly changing and ever more capable technologies -- technologies which must be assessed in their ability to assist governments enhance their constituent services while simultaneously increasing the efficiency and effectiveness of government as a whole. Two examples of the marriage between IT and government service provision are discussed in detail: food stamps and Medicaid/Medicare. Both are Federally mandated programs that state and local governments must carry out.

Food Stamps

The United States Department of Agriculture, through its Food and Nutrition Service (FNS) department, oversees the nation's supplemental food programs including: food stamps, aid to families with dependent children (AFDC), women, infants and children (WIC), general assistance (GA), as well as supplemental income programs. The food stamp program is regulated by USDA's FNS; however, it is the state and local governments that actually provide the services to benefit recipients. In 1984, FNS, through its Demonstration Project Section (DPS), began experimenting with electronic transfer of food stamp benefits through a pilot project in Reading, PA (Office of Technology Assessment, 1988c).

Electronic benefits transfer (EBT) is an extension of the existing nation-wide financial electronic funds transfer network and point-of-sales (POS) technology (Department of Agriculture, 1992, p. 2). EBT allows for the monthly transfer of FNS benefits to an electronically posted computer file, to which benefit recipient access is achieved through the use of an EBT access card in combination with a recipient's secret access code. A benefit recipient takes his or her card to a participating grocery store, purchases necessary items, and passes the access card through the POS terminal. The recipient's benefits are verified online, and, if approved, appropriate deductions are made for purchased items. As such, EBT eliminates the need for paper food stamps as well as the provision of cash change (up to $.99 per coupon purchase). EBT is an automatic teller machine (ATM) service for food stamps.

For policy guidance, there is an EBT Steering Committee comprised of Federal and state government officials, as well as various national associations. At the Federal level, participating agencies include USDA, HHS, Department of Labor, Department of Treasury, the Railroad Retirement Board, the Office of Management and Budget, and the Federal Reserve Board. At any one time, depending on ongoing projects, a selection of state representatives may collaborate with the EBT Steering Committee, as well as national organizations such as the American Welfare Association and the National Association of State Auditors, Comptrollers, and Treasurers.

The Role of FNS in EBT

FNS' role in EBT is that of program overseer and coordinator. EBT requires cooperation between Federal agencies, state and local governments, and the financial and retail industries. The food stamp program is administered by FNS while the paper coupons are printed and distributed by the Federal Reserve. State and local agencies receive the paper coupons and distribute them manually to benefit recipients. Further, when paper coupons are redeemed by retailers, the Treasury Department deposits the funds directly into the retailers' bank accounts. EBT eliminates all of this paperwork, replacing the entire paper process with an electronic system. FNS provides the coordination between all food stamp participants, ensuring a smooth delivery of benefits to the recipients and providers.

All states wishing to participate in EBT must receive program approval from FNS. States which are interested in adopting EBT must submit a Planning Advanced Planning Document (PAPD) which demonstrates the states' interest in EBT. The PAPD is essentially a cost analysis combined with a request for proposal (RFP). FNS reviews the document, comments upon it, and expects its comments to be incorporated in the final versions. The final RFP is reviewed again before FNS grants the state permission to distribute it. Once the RFP is released by a state, it is the responsibility of the state to review vendor responses and select the appropriate vendor. When a selection is made, the state submits the contract to FNS for final approval. FNS specifically analyzes the system's design document, the implementation plan, and the functional specifications plan. FNS informs the state of any contract deficiencies, to include necessary changes prior to the issuance of final approval.

Once final approval is given, FNS awaits the system's development. FNS will not let a system go online until it first (through the DMS): stresses the system for one week in an attempt to break it; performs recovery tests; and performs other "what ifs." FNS also keeps in close contact with new EBT state participants to ensure proper functioning.

EBT Participation

Participation in an EBT program is voluntary and cannot cost more than the existing paper coupon system (guidelines were established through the 1990 Mickey Leland Memorial Domestic Hunger Relief Act, P.L. 101-624). That is, no state may be forced into creating an EBT system, and the costs of implementing an EBT may not exceed the current cost of the paper food stamp program. This form of implementation mandate presents an immediate problem: without increased participation in EBT, economies of scale on necessary IT cannot be achieved. Further, the lack of economies of scale does not present an accurate picture of EBT program cost savings, or what the savings could be with greater EBT participation. Moreover, Linn County, Iowa is initiating a "voluntary" EBT system in which benefit recipients may choose to receive benefits in either paper or electronic forms. As such, the county must maintain simultaneously both paper and electronic systems. Unless some form of mandatory compliance is instituted, there may well never be a nation-wide EBT program. New York City's program is a case in point.

In 1981, New York City implemented an automated cash and coupon delivery system known as the Electronic Payment File Transfer System (EPFTS) to provide AFDC and GA benefits (Wood and Smith, 1991). Participants are issued magnetic-strip cards that may be used at approximately 425 attended locations throughout the city, most of which are in check-cashing centers with some in bank branches. Benefit recipients must go to the benefit redemption centers with their cards, where the client's entire monthly benefit is distributed upon identity verification. The New York City Human Resources Department claims to save $9 million annually through the use of the EPFTS. However, EPFTS is not EBT (as defined by USDA). In fact, it is a completely different, yet expanding, system. At some point, FNS will have to consider the "voluntary" nature of EBT if it is to achieve its goal of nation-wide EBT.

In all, there are six operational EBT programs: Ramsey County, MN, where 285 participating food stores serve 20,000 food stamp households; Albuquerque, NM, where 170 retailers serve 22,000 food stamp households; Reading, PA, where 125 retailers serve 7,000 food stamp households; Dayton, OH, where 12,000 food stamp households access their benefits with smartcards via 80 retailers; Casper, WY, where 700 households will receive their WIC benefits through smartcards; and the state of Maryland, where 3,400 retailers serve 138,000 food stamp recipients. FNS states that its goal is nation-wide EBT. To date, 14 additional states have expressed an interest in initiating EBT projects, the most interesting being a combined application by the states of North and South Dakota (Department of Agriculture, 1992, p. 3).

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EBT Goals and Savings

FNS, through the deployment of EBT, has specific program goals that include (Department of Agriculture, 1992 p. 2): reduced administrative costs through lessening the paperwork burden of the paper coupon system; more precise data on benefit draw downs, thus enabling USDA to improve its cash management of the benefit redemption accounts; the reduction of coupon fraud (while no precise measure of coupon fraud loss exists, it is known by FNS analysts that coupons may be sold for as much as up to $.75 on the dollar); and greater benefit recipient services through more efficient and effective service delivery, including the provision of multiple benefits through one EBT delivery mechanism (an idea, that filtered up from state and local governments).

Overall, though, the projected, combined FNS and states' operating costs of EBT are approximately $3.40 per case month (the cost of handling one case per month), while the average paper coupon cost is $3.00 per case month (Department of Agriculture, 1992, p. 19). As mentioned previously, these figures reflect limited EBT use with new technology. As EBT expands, costs should decrease.

State and County Information Management: the Combination of Services

At its inception, FNS viewed EBT as a vehicle for food stamp benefit delivery. However, state and local governments quickly expanded the narrow, original focus of FNS to the provision of other welfare benefits such as WIC, AFDC, and GA. In fact, Ramsey County provides the following services to its benefit recipients: food stamps, AFDC, GA, Refugee Assistance, and State Supplemental Security Income. Albuquerque, NM and Reading, PA combine food stamp assistance with AFDC. Further, the state of Maryland (the only state-wide EBT program in existence) with its Independence Card, combines the delivery of food stamps, AFDC, GA, and Child Support Enforcement (CSE, a non-public assistance program to be available only in the Baltimore area) into a single benefit delivery system.

State, county, and local governments, through their information management policies, were ready and able to provide more efficient and effective constituent services. That is, since many states and counties had developed and implemented information resources management strategies that incorporated all state and county government resources including IT, they were ready to expand upon initial FNS EBT mandates.

What do the Users and Providers Think of EBT?

While little formal end-user satisfaction with EBT has been demonstrated, some data are available. A 1987 benefit recipient survey in Reading, PA found that 70 percent of the recipients participating in EBT preferred EBT to the coupon system. This preference held for all benefit subgroups such as the disabled, the elderly, and non-English speaking individuals (Department of Agriculture, 1992). In a 1988, and subsequent 1990 informal follow-up, benefit recipient survey conducted in Ramsey County, MN, 88 percent of the benefit recipients preferred EBT to the coupon system. These results held true for all benefit subgroups as well (Ramsey County Community Human Services Department, 1992).

Benefit recipients who responded favorably to EBT gave the following reasons: convenience, security, ease-of-use, and benefit redemption flexibility in that benefits no longer have to be taken in one lump sum on a monthly basis. Further, EBT use promotes an integration of economically disadvantaged individuals into the mainstream of technology such as ATMs. Benefit recipients who preferred the coupon system gave the following reasons: greater ease of cash/benefits management and quicker check-out times.

One critical success factor for such high benefit recipient satisfaction is the EBT training program. FNS mandates that all EBT participants receive extensive training on how to properly use the EBT system. This training includes classroom instruction on EBT purposes and functions, a video presentation which describes in detail the use of EBT and POS terminal locations, and "hands on" experience with the POS terminals (many training facilities, in fact, have POS terminals located in their EBT training centers). EBT instruction is available in non-English languages (the types of non-English languages vary by individual EBT program needs).

Financial institutions prefer EBT for several reasons: benefit recipients no longer have to crowd banks one day a month in order to cash their benefits checks or redeem their coupons; retailer accounts are electronically updated nightly to reflect coupon purchases through computerized procedures known as the Automated Clearing House (ACH) process; and costs associated with posting accounts are reduced by 90 percent (Department of Agriculture, 1992, p. 12).

Seventy-five percent of retailers surveyed in Reading, PA prefer EBT to the paper coupon system for the following reasons: speed, ease-of-use, efficiency through the elimination of paper coupon intake and processing functions, accuracy, and the reduction of program fraud and abuse (Department of Agriculture, 1992 p. 9). Fourteen percent of Reading's retailers prefer the paper coupon system due to problems with: damaged access cards, computer downtime, printer problems, speed of transaction with coupons, and ease of reconciliation with coupon bank deposits as opposed to electronic transfers.

Technological Innovations in the Benefits Application Process

One form of technological innovation sweeping state, county, and local governments is the information kiosk. A kiosk is a publicly accessible multi-media information system that provides its users with state and local government information. Initially, kiosks provided their users with information services such as city hall directories, public official phone numbers, and fishing and hunting license requirements. Recently, kiosks have moved into a transactional phase in which actual services may be provided to constituents.

For example, residents in Tulare County, CA who wish to apply for welfare and medical benefits (MediCal and Medicaid) may now do so through a kiosk. The AFDC, MediCal and Medicaid applications are cumbersome to complete and errors can easily result in completing the application. Benefit applicants now come to the central social services office and proceed through a touch-screen, menu-driven application process. In cases where information needs to be keyed in, an alphabetically ordered keyboard appears on the screen for use. Once an applicant completes the application and eligibility is determined, a hardcopy is printed for review by a county benefits clerk, with an electronic copy already online in the county's benefits information system. Any errors on the application are corrected during the review process; files may also be updated at a later date.

At present, the Tulare County kiosks present information at a low literacy level in both English and Spanish, with other languages being considered for application processing. Further, the use of kiosks has enabled the ratio of social services clerks to applicants to go from 1:1 to six kiosk applications to 1 clerk. This permits on-duty clerks to perform other duties. Also, application errors have been dramatically reduced. The application kiosk software is an expert system that contains over 7,000 benefit rules and regulations. Clerk interpretation error has been greatly reduced, plus any changes in Federal and state regulations may be coded into the system within an hour. In fact, it is estimated that the county is saving $40,000 per day through reduced data entry errors (Newcombe, 1991, p. 45).

Medicaid/Medicare

Health and Human Services' (HHS) Health Care Financing Administration (HCFA) is responsible for the management and oversight of the nation's Medicaid (medical assistance to the economically disadvantaged) and Medicare (medical assistance to the elderly and certain recipients of Social Security benefits) programs. In fiscal year 1991, Americans spent $655 billion on health care, out of which $80 billion (12.2%) was due to public and private insurance administrative costs, $43.6 billion (6.7%) was attributable to claims processing and premium collection, and $36.2 billion (5.5%) went to cover billing costs (taken from 1992 HCFA Statistics, published by HHS). Add to these expenditures the fiscal year 1992 costs of Medicaid of $100 billion, and one can easily conclude that the United States spends a vast amount of capital and human resources on publicly funded medical assistance.

At present, Medicaid and Medicare are Federally mandated programs that are executed through state and local governments. A most basic description of the Medicaid and Medicare programs is that the Federal government creates the guidelines for their management, administration, and reporting requirements, and states are free to modify, so long as they meet the basic HHS requirements, the dissemination of medical benefits as they see fit. As such, there are essentially 50 Medicaid and Medicare programs in existence in this country. This includes the use of medical benefits forms. While there is a standard Medicaid form (HCFA-1500), states can, and do, modify the form to suit their purposes. This has resulted in 50 different Medicaid benefits processing and tracking systems.

To counter the large expenditures encountered through such a complex national medical assistance program, HHS is looking to alternate means of service delivery. To this end, Secretary of Health and Human Services Dr. Louis Sullivan convened a forum of national health care leaders in November 1991. Out of this forum, three task forces were created to analyze health care costs and delivery methods: the Workgroup on Electronic Data Interchange (WEDI), the Taskforce on Patient Information, and the Workgroup on Administrative Costs and Benefits. This section describes the efforts of the WEDI.

The Workgroup on Electronic Data Interchange

The WEDI project is a public/private partnership involving Federal and state government representatives, as well as insurance, technical, and health care provider participants. In all, the WEDI steering committee comprises 15 public/private members and is supported by a technical advisory staff of 50.

WEDI has as its goal the streamlining of medical benefits administration through the deployment of electronic data interchange (EDI) technology. EDI is the technology through which entire records may be transferred between participating governments, agencies, providers, and insurance companies (such records are compatible across various participants due to predetermined technological transaction standards) (Wigand, 1992). A first major step to achieve nation-wide health care EDI is to standardize both Medicaid and Medicare health insurance claim forms. This will assist in the definition of required data elements which, in turn, will allow for the development of standard fields for the EDI process.

HCFA intends to proceed with its WEDI recommendations with or without legislation (S. 2878, introduced in the 101st Congress, 2nd Session on June 23, 1992 was not passed), and has issued a proposed rule (Federal Register, Monday, October 19, 1992). In fact, Secretary Sullivan has called for EDI adoption to increase by 10 percent annually (Workgroup on Electronic Data Interchange, Appendix 5, p. 19). Assuming the establishment of data element and transaction standards by 1994, this would create a

90 percent level of EDI penetration by 1997. At 90 percent, administrative and cost reduction benefits for the provision of medical assistance through EDI are quite substantial.

The Cost Savings of EDI

Cost savings due to EDI in a variety of benefits provision areas are, at this point, all speculative and based upon high levels of EDI penetration. However, the following table estimates the anticipated EDI savings (Workgroup for Electronic Data Interchange, 1992):

Table 2. Direct Administrative Savings from EDI (in $Millions)

	Enrollment and Certification	Eligibility Verification	Claims Submission and Processing	Claim Inquiry	Payment and Remittance	Total
Patients						
Providers	$50-$100	DNA*	DNA*	DNA*	$1,120	$1,170-$1,220
Payors	$50	$300	$1,400	$50	$128	$1,928
Employers	$70-$110					$70-$110
Total	$170-$260	$300	$1,400	$50	$1,128	$3,168-$3,258

* Data not available

Overall, EDI offers significant potential as a technology that can be wedded to services delivery for considerably improved performance, cost reductions, and improved collaboration among government units.

NEED FOR A VISION

State, county, and local governments have performed extensive reviews of their information resources, and they have assessed the importance, relevance, and function of these resources. Moreover, state, county, and local governments have modified their organizational structures, work processes, and information management policies to incorporate their strategic objectives, the alignment of strategic objectives and IT, and the enhancement of constituent service provision.

State, county, and local governments are far ahead of the Federal government in the area of providing multiple services through single methods of delivery as demonstrated by state and local governments' provision of several welfare benefits through one application process and EBT. However, state, county, and local initiatives do not stop at the provision of welfare benefits. In fact, most recipients of food stamp and other welfare programs automatically qualify for state medical benefits. As such, Ramsey County EBT benefit recipients also receive some supplemental medical benefits. (A phone conversation with a Ramsey County social services employee indicates that there are currently a total of 34,958 people receiving both AFDC and medical assistance, representing 7 percent of Ramsey County's population). This holds true for most states (New York, California, and Maryland, to name a few). However, while states are providing "one-stop-shopping" to benefit recipients, similar Federal government service provision is disjointed and has no policy for combining, for example, both medical and welfare benefits. Because of this, EBT remains solely a welfare technology, and EDI will remain solely an HHS technology. Meanwhile, states continue to determine simultaneously welfare and medical benefits eligibility through one application, thus enabling the provision of greater, and more efficient, constituent services.

The Federal lack of vision is an odd one indeed, considering that the previously mentioned EBT Steering Committee membership comprises both HHS, OMB, and USDA. Knowing that there is overlap in recipients of both welfare and medical benefits, it would seem natural to reduce the administrative redundancy required to manage and administer such programs (as state governments have done). However, this does not appear to be a goal at the Federal level. While the Federal government does appear to be "steering" rather than "rowing" (Osborne and Gaebler, 1992), it has yet to learn to manage its information resources and coordinate its services provision.

The Federal government needs to learn what state and local governments recognized some time ago:

- Strategic objectives must be clearly enumerated, and all government and/or agency functions must operate through those objectives
- Constituents are the equivalent of business customers and deserve effective and efficient service
- Information technology is a resource that, when managed properly, can greatly enhance the provision of services and reduce government operational costs
- Services to constituents and overall government effectiveness are enhanced through collaboration – intragovernmental, intergovernmental, and government-private partnerships
- Assessment of governmental information resources avoids the re-invention of the wheel as well as duplication of effort, thus leading to cost savings and better government operation
- Communication, not competition, across governmental agencies is crucial for effective, efficient, and productive government service delivery.

The Federal government stands on the threshold of large-scale entrance into the electronic delivery of services. The Federal government has a choice of crossing that threshold timidly without a strategic plan for service delivery in place, or crossing boldly with forward-looking vision.

Such vision, however, has as its foundation appropriate information policies, as well as management and technology infrastructures. Moreover, these policies and infrastructures must incorporate those already in place at the state, county, and local government levels. Such integration would promote greater government efficiencies across all levels of government, leading to overall greater constituent services. The policy issues discussed in the next section set the stage for developing such a vision and developing a government-wide initiative to realize that vision.

V. POLICY ISSUES

THE FEDERAL INFORMATION POLICY SYSTEM

Federal information policy is a set of interrelated principles, laws, guidelines, rules, regulations, procedures, and judicial interpretations that guide the oversight and management of the life cycle of information, i.e., production, collection, distribution-dissemination, retrieval, and disposition. Information policy is also concerned with issues related to the access to and use of information. The Office of Technology Assessment (1988b) provides an overview of Federal information policy related to dissemination, and Hernon, McClure, & Reylea (1989) and Hernon & McClure (1992) summarize the key policy instruments and issues that comprise Federal information policy.

Proposed revisions to OMB Circular A-130 (Office of Management and Budget, 1992c) define government information simply as "information created, collected, processed, disseminated, or disposed of by the Federal government." This is a broad definition, encompassing published and unpublished information in print, digitized, or other formats.

Federal information policy focuses on those policies emanating from government bodies and dealing with the life cycle of government information. There are many intricate aspects of Federal government information policy, including the role and activities of various stakeholders or actors in the political process. Indeed, Congress passed more than 300 public laws between 1977 and 1990 related to information policy and technology (Chartrand, 1991). These laws, as well as a host of agency guidelines and directives, court decisions, and other documents constitute the Federal information policy system.

"System" may be inappropriate to describe Federal information policy. Generally, there is no coherent Federal information policy system per se in the United States. Rather there is a broad array of legislation, regulations, and agency-directed policies that affect the management of government information. Thus, the policy system that directs the life cycle of government information is oftentimes ambiguous, contradictory, and very much decentralized.

Federal information policy may be thought of in terms of policy that has as its purpose, providing (1) broad generalized guidelines to all Federal agencies for managing the life cycle of information and information technologies, (2) specific guidance either for or within a particular agency, and (3) guidance for the management of the life cycle of information and information technologies for particular subject or topical areas. Within each of these areas, existing Federal information policy is struggling to cope with an electronic environment. A number of the existing policy instruments were developed in earlier times when electronic information was not as pervasive as now. And The current movement toward the use of digitized government information has the potential to radically alter the way government services are delivered.

There are two competing points of view regarding the appropriateness of the information policy framework related to the electronic provision of government services. The first perspective is that the existing framework, based primarily on OMB Circular A-130, the Paperwork Reduction Act of 1980, and a host of additional policy instruments, provide an adequate policy basis for the development of government-wide electronic services provision. A second perspective offered to the study team was that the existing policy framework for the provision of electronic government services was inadequate, out-of-date, and that a range of specific initiatives are needed to accomplish the objective of successfully delivering government information electronically.

Regardless of one's perspective of the need for developing new government-wide policies or fine-tuning policy within the existing policy system, a number of key policy issues require attention if the government is to successfully deliver services electronically. Figure 6 describes a perspective used by the study team in identifying and describing the most important policy issues related to the government's provision of electronic services. Government programs and services are inextricably linked to the management of information resources. The services are developed and administered within an information policy setting as well as four key interwoven contexts.

In terms of the first context, we found wide variance in the organizational/cultural composition of agencies. Second, the political or ideological context set by the administration affects agency views toward provision of electronic services. This political context, although set from the Executive Office of the President, is often-times interpreted differently by individual agency administrators. Third, the legislatively mandated mission of the agency may encourage or discourage the agency to be a provider of electronic services. Finally, the management style and techniques within the agency, and more specifically, administrators' knowledge and competency regarding electronic services, also affect the agencies' use of technology and their attitude toward services provision.

The study team identified numerous policy issues that could affect the provision of electronic services (see Section V). But to determine which of these policy issues were of greatest importance, the study team assessed these issues in light of the following criteria:

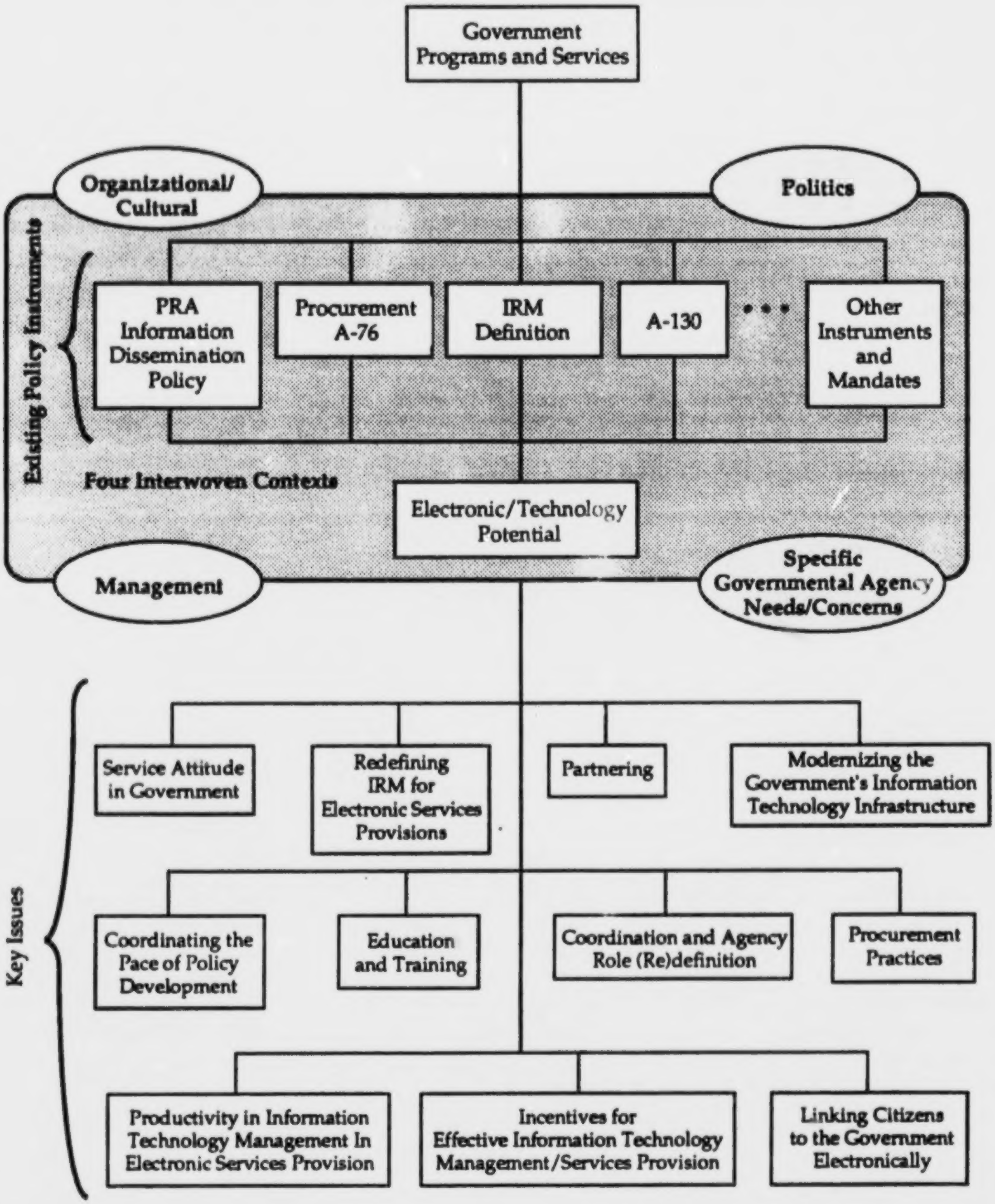
- Pervasiveness: degree to which the study team identified the issue in different governmental settings
- Impact: likelihood that the issue must be addressed and resolved if the government is to move toward improved provision of services electronically
- Cost savings and improved effectiveness: could agencies in particular, and the government overall, realize cost-savings and/or improve their effectiveness by resolving the issue
- Resolvability: the issue has potential to be resolved, there are possible intervention strategies to deal with the issue.

Based on these criteria, the key policy topics listed on the bottom of Figure 6 appear to be especially important and require Congressional attention. Each topic, with a listing of key issues and their implications for electronic services provision, is discussed in the following sections.

MODERNIZING THE GOVERNMENT'S INFORMATION INFRASTRUCTURE

Information infrastructure is the basic foundation of IT capability, budgeted for and provided by the information systems function, and shared across multiple administrative units (Weill, 1992b). The term includes the hardware, software, communications, other equipment, and human resources and policies required for the government to successfully conduct its business in an electronic environment (Aschauer, 1989). To some degree, many agencies must rely on their own creativity and resources to have adequate IT support. It appears that there is no "government-wide" information infrastructure upon which they might draw.

Figure 6
Policy Perspectives for Design of Electronic Government Services


Government Programs and Services
Organizational/ Cultural
Politics
Existing Policy Instruments
PRA Information Dissemination Policy
Procurement A-76
IRM Definition
A-130
• • •
Other Instruments and Mandates
Four Interwoven Contexts
Electronic/Technology Potential
Management
Specific Governmental Agency Needs/Concerns
Key Issues
Service Attitude in Government
Redefining IRM for Electronic Services Provisions
Partnering
Modernizing the Government's Information Technology Infrastructure
Coordinating the Pace of Policy Development
Education and Training
Coordination and Agency Role (Re)definition
Procurement Practices
Productivity in Information Technology Management In Electronic Services Provision
Incentives for Effective Information Technology Management/Services Provision
Linking Citizens to the Government Electronically

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During recent years there has been significant pressure on agencies to cut expenses and better justify their purchases of IT due to the increasing Federal deficit. These pressures have occurred at the same time as remarkable advances in new IT hardware and software have occurred. The result has often been increased obsolescence of the agency's information infrastructure.

Preliminary evidence from the data collection activities suggest that a major long term effort will be needed to systematically modernize the (1) IT available to Federal agencies, (2) deployment and coordination of IT use government-wide and by individual agencies, and (3) thinking about how best to use information infrastructure to provide government services.

Key Issues

The modernization of the government's information infrastructure will require addressing a number of issues:

- What constitutes a "modern" and "effective" government-wide information infrastructure?
- Should the government be able to provide a basic level of information infrastructure that can be drawn on by other agencies or are agencies expected to develop their own information infrastructure? What level of compatibility should be expected across agency infrastructures?
- Is OMB-OIRA responsible for ensuring the development of a government-wide information infrastructure (under the Paperwork Reduction Act) – if not OMB-OIRA, then which agency is responsible? How successful has OMB-OIRA been in this area and to what degree are additional policy guidelines required?
- How can adequate funds be obtained, authorized, and effectively managed to support the development of a modern and effective government information infrastructure?

Information infrastructure must be deployed for services provision, not agency data processing. The infrastructure needed for such services provision may be quite different from one that is intended to support primarily internal agency operations. Much thought needs to be given to development information infrastructures both at a government-wide level and at an individual agency level.

Implications for Electronic Services Provision

Clearly, government agencies cannot be expected to provide innovative delivery of services in an electronic environment if they lack a modern and effective information infrastructure. Currently, there is a wide disparity among the various agencies in terms of (1) the basic components that comprise their information infrastructure versus a government-wide information infrastructure, (2) the currency and sophistication of those infrastructures, (3) the success with which the agency uses that infrastructure to support agency mission and enable the provision of electronic services, and (4) the degree to which there is infrastructure inter-operability among the various governmental units.

There are some pockets of government electronic services provision which rely only, for example, on an IBM 286 PC and public domain bulletin board software. But significant, innovative, and widespread delivery of government services in an electronic environment will require a government-wide and agency-based modern and effective information infrastructure. Such an information infrastructure is a prerequisite for the planning, delivery, and assessment of electronic government services provision.

LINKING CITIZENS TO THE GOVERNMENT ELECTRONICALLY

If the Federal government is to be an effective provider of electronic services, it must participate in a national electronic network that seamlessly links the various segments of society together. The linking process must be as ubiquitous as the current telephone system. With the passage of the High Performance Computer Act of 1991, such a network is evolving and is likely to serve as the foundation for a national information infrastructure (Office of Science and Technology Policy, 1992). Bringing together the Internet with FTS 2000 as a means for linking citizens to the government electronically must be explored.

The government has many issues yet to resolve to successfully connect to the Internet and FTS 2000 into the evolving NREN. Indeed, many Federal agencies are outdated "islands" in the electronic stream of communication. Interconnectivity and interoperability among Federal agencies and between Federal agencies and the public is a prerequisite for provision of electronic services to the public.

Key Issues

The topic of linking citizens electronically to the government raises numerous issues. The most important include the following:

- What type of technology and under what type of administrative structure is most appropriate to serve as a national electronic network?
- How can existing Federal networks (e.g., FTS 2000, NSFNet, etc.) be interconnected and linked to the Internet or other electronic networks?
- Can the NREN serve as the national electronic network for linking government with the citizenry?
- What is the role of libraries in providing support for the national electronic network and how might they best serve as intermediaries in linking the public to the government electronically?
- Can a single, easy-to-use interface be devised which provides effective access to a range of electronic government services and products?

A national electronic network that links the public to the government in a ubiquitous and pervasive manner will require careful planning, coordination, resource support, education and training, and perhaps most importantly, on-going upper level governmental support.

Implications for Electronic Services Provision

Currently, there is a significant fiber cable infrastructure in this country. But in addition, a majority of homes are already connected via cable television and by the telephone. These and other evolving technologies appear to be converging . New technologies that compress message flow for cable television and twisted pair increase their potential to serve as delivery mechanisms for a national network. Because of increasing convergence among various electronic information technologies, it is unclear how such a national electronic network might be achieved (Office of Technology Assessment, 1989b). But it is clear that the Internet/NREN should be a major component of that network.

But regardless of the shape and form of the national network, there will need to be intermediaries, such as libraries, that have responsibility to:

- Insure wide public access to the network, especially to those who are unable to purchase the necessary equipment, or who need help and education in how to use the equipment
- Develop community-based information services and resources to complement and add value to those being provided by the Federal government
- Translate the uses and applications of the national network to local citizens, businesses, educational institutions, and other groups.

In the design of the national electronic network that links the citizenry to the government, it will be essential to design support systems for the use of that network. Libraries can have an important role to play in this area (McClure, Ryan, & Moen, 1992a).

INCENTIVES FOR EFFECTIVE INFORMATION TECHNOLOGY MANAGEMENT/SERVICES PROVISION

Throughout the discussions with various government officials, a persistent theme was the lack of incentives for individuals and agencies to deliver services in an electronic environment. Agency officials commented that government lethargy, restrictive and time-consuming IT procurement policies, administrators' ignorance or lack of interest in electronic services, an inadequate information infrastructure, and too many other conflicting responsibilities combine to limit their development of electronic services.

Some agency officials commented that should they develop such electronic services, officials would have to spend more time dealing with the public, answering questions, and providing assistance. Indeed, one official told members of the study team that "I do not work for the public, I work for Congress." In addition to this attitude, other concerns regarding incentives are apparent. For example, some agencies are unable to retain money received by the provision of the services, or saved by innovative IT applications and have to return it to the Treasury. In short, the agencies identified many disincentives to develop innovative electronic services.

Key Issues

Currently, there are perceived to be few incentives for designing and implementing electronic services. Issues related to this concern include the following:

- What policy initiatives could be developed to encourage agencies to experiment and innovate with the provision of services electronically?

- What policy initiatives could be developed to remove the disincentives for agencies to provide services electronically?
- Has Congressional and Executive branch oversight/regulation inhibited agency risk taking, innovation, and the development of a strong service perspective?
- Can specific cost savings or other benefits be demonstrated by agencies that provide services electronically?

As described in Osborne and Gaebler (1992), until the agencies see that there are more rewards and incentives for changing traditional work behaviors i.e., moving to an electronic services environment, they are likely to continue as they have in the past.

Implications for Electronic Services Provision

New information technologies and applications enter the market at a staggering rate, with costs often falling with similar speed. This can place agency officials in a situation in which some modest risk taking can pay off handsomely. At the same time though, the IRM manager should not be penalized for taking such risks. Many IRM and telecommunications applications have matured through experimentation, some well ahead of developments in the private sector. A climate needs to be created that fosters risk taking and experimentation.

It is quite disappointing and, for the IRM employee, discouraging to see that funds saved through innovative IRM applications must be returned to the Treasury. Such an environment does not provide an incentive for the IRM employee to become innovative. This situation is often further exacerbated when the agency head and IRM officials do not share a similar view toward innovation and experimentation. Quite often it is apparent that a vision in terms of IT and telecommunication technology is simply nonexistent, i.e., business as usual prevails, even though service needs of the public are not met well, even where electronic IT might enable such needed services easily in a timely fashion. In an environment where no incentive existed to be innovative and creative, we were told of one desperate employee who used $1,200 of his own money to demonstrate that a particular IT application would be successful.

A revolving fund for IT experimentation and investment should be made available to every agency. The Veterans Administration's Corporate Investment Fund for special IT projects might serve as a model. This agency uses two percent of its IT budget for such purposes. Moreover, it would be a special incentive if portions of the funds saved could be rolled back into this Fund. Such a mechanism would provide needed incentives and motivation for IRM organizations to become innovative and creative in their IT applications.

There are likely to be a range of possible benefits and incentives for agencies to more toward electronic information services provision, including:

- Do more work with less time, less resources, or less effort
- Better accomplish agency mission
- Be more responsive to the public's needs

- Save time/resources in fulfilling FOIA requests
- Better locate and identify agency information resources
- Better coordinate work efforts with other agencies and governmental units.

Agencies need encouragement and incentives to take risks and experiment with new approaches to provide services electronically. Considerable thought needs to be given to how best such incentives can be provided.

REDESIGNING IRM FOR ELECTRONIC SERVICES PROVISION

There is no entity within the Federal government that concerns itself centrally and in a focused fashion with government-wide implications or strategic positioning of IRM and information and telecommunications technology. Even though the GSA and OMB have taken on some of these tasks, their foci have been directed toward agency IRM practices. The GSA deserves special recognition in its various efforts to prepare and educate IRM managers and to share information about IRM in general. The current "1000 by 2000" program, i. e. educating 1,000 Federal IRM managers by the year 2000 is a laudable effort.

Government-wide, however, it appears that a certain level of vision and strategic direction is missing that will move the Federal government's IRM efforts into the next century. OMB-OIRA is in special need of revitalization (Sprehe, 1992). Previously, it has been an agency concerned primarily with paperwork reduction and information systems management. For it to be successful in the future, it must be more proactive, it must refine and develop IRM policies, coordinate agency IRM practices, enforce information policies uniformly across the agencies, and promote a services perspective in agency activities.

Key Issues

Numerous concepts and issues comprise a vision of IRM for electronic services provision, and the following items address key concerns:

- How might the government define and implement a broader and more far-reaching vision of IRM?
- What measures can be taken such that agencies develop an overall IRM framework with a deliberate service orientation?
- How can funds be made available within each agency for employees to participate in IRM training and education?
- How can mechanisms be created that encourage external partnerships (with other levels of government, as well as with the non-profit and private sectors) in reaching citizens electronically?
- How can mechanisms be created that reward experimentation, innovation and provide incentives for the IRM organization?

- How can mechanisms be created that keep IRM managers abreast of major developments in the IRM and telecommunications fields (e.g., paradigm shifts such as business process redesign)?
- How can a mandate be provided to agency heads to provide electronic services where feasible and appropriate via a Federal government information infrastructure?
- How can a deliberate effort be created that entices agencies to join government-wide and other national information infrastructure configurations?
- What are IRM managers' responsibilities to safeguard the privacy and security of government information – for both the government and the individual – in a networked environment?
- How might a governmental entity be created or empowered with effective jurisdiction over all branches of government and all agencies regarding management of information infrastructure?

These issues suggest the importance of redesigning IRM for managing IT for electronic services provision.

Implications for Electronic Services Provision

The current IRM effort is focused on internal efficiencies. This effort is important and should continue, but the electronic world challenges IRM to deal with a larger interconnected environment that is services oriented. It is important to create an IRM vision going well beyond existing agency boundaries. Incentives and innovations need to be encouraged that make possible a broader IRM vision that is government-wide and encourages linking with other levels of government, the non-profits, and the private sector where appropriate. Partnering of this sort is desirable and risk-taking behavior of IRM organizations on a limited scale ought to be made possible. Such an effort should start with a service orientation. It is this service orientation that should drive the agency and from which the agency and the IRM organization learns to structure itself.

COORDINATION AND AGENCY ROLE (RE)DEFINITION

Essential to a unified, government-wide effort of electronic service delivery is a coordinated, integrated and more centralized approach to IRM. The concept of IRM should include a range of information activities, including automated data processing, telecommunications, public information officers, librarians, and records management. Far too much variation in quality, strength, depth and attention paid to IRM exists from agency to agency. Some agencies demonstrate a considerable extent of innovation and experimentation, yet others – with considerable opportunities to take advantage of obvious electronic service delivery potentials -- chose deliberately to ignore such and other opportunities. Obviously, the commitment to IRM varies considerably from agency to agency. Although some variation is to be expected, as IRM may fulfill differing needs in agency missions, some agencies deliberately ignore, deemphasize or downplay the IRM functions.

Thus, it is not sufficient to just pay lip-service toward an IRM orientation. Techniques need to be provided that agency heads, not just IRM managers, become believers and advocates for these important areas. Few agency IRM and telecommunications efforts show efforts of cooperation or joint-ventures with other agencies engaged in similar efforts or having to reach the same target group via electronic means. One conceivable framework that could provide a more unified and government-wide role to IRM and telecommunications would be the specific appointment of an oversight and central office with just such a mission. Such an office could develop an appropriate vision, as well as appropriate administrative mandates and power to implement IRM and telecommunications efforts at the agency level.

Key Issues

Embedded in such a government-wide coordination and redefinition of agencies' roles in IRM and telecommunications are the following key issues:

- How can a concentrated and directed commitment to IRM be instilled in agency heads?
- What sort of mechanisms might exist to *enforce* an IRM orientation and commitment in agency heads, IRM managers, and appropriate others?
- What mechanisms and incentives can be created to bring about an IRM reorientation such that agency heads and IRM and telecommunications managers think and operate not just toward their own agency-internal benefits, but that they think and operate in terms of services and joint, cooperative and government-wide strategic efforts?
- What organizational and government-cultural changes might be needed to bring about a flexible, dynamic and networked IRM and organization *across government*?
- Can senior agency IRM officials and basic IRM ideas and concepts be made more visible and significant in the decision making process?

It is important to stress that cultural dimensions of how IRM has evolved in the Federal government may be a key factor to address in its redefinition.

Implications for Electronic Services Provision

The delivery of electronic services must be a coordinated, planned, directed and government-wide effort, not as presently practiced an agency-internal effort. To reach citizens and business users of electronic services a Federal, i. e., a government-internal, electronic infrastructure needs to be created. This implies cooperation with other agencies. Moreover, an appropriate vision of reaching citizens and businesses on a broad scale suggests also a commitment of the Federal government to position itself such that other, i. e. non-Federal government portions of an emerging national information infrastructure can be joined.

PRODUCTIVITY IN INFORMATION TECHNOLOGY MANAGEMENT IN ELECTRONIC SERVICES PROVISION

Investments in IT grew rapidly in the 1980s but their impact on productivity improvements is unclear. The service sector alone is said to own 85 percent of the installed base of U. S. IT. Often this phenomenon is referred to as the productivity paradox. Information technology has the potential to affect positively the productivity of agencies in accomplishing their missions and in the delivery of electronic services. By definition, such services cannot be provided without IT. An increase in productivity, however, is not necessarily a given by simply introducing IT and software or applications.

Productivity in this setting, i. e. white-collar productivity, is not easily measured and tends to be controversial. Sometimes we find productivity measurements emphasizing efficiency aspects and at other times emphasizing outcomes of worker activity. Yet others, e. g., Strassmann (1990) and Loveman (1988) stress that the best IT investments are made in mission-critical applications. Moreover, Panko (cited in Metcalfe, 1992) claims that the productivity data we tend to collect are "dirty" and have "noise" in them, i. e., data that do not reflect the complete or a measurement-specific picture of productivity.

Very often IRM officials within the public and private sector alike have focused inappropriately on the IT employed,i.e., the inputs, and expected a direct causal linkage with productivity gains. While such is unlikely, it is an understandable view. We should not expect such a linkage though, as IT is linked to a *business process* which, in turn, hopefully will deliver a productivity gain. In essence, we have probably not sufficiently focused on the role and proper re-design, invention or re-invention of appropriate business processes within the context of IT applications. Once business processes are designed and institutionalized, we can then focus on productivity gains. It is important though to reiterate that productivity gains come from appropriate business processes coupled with the appropriate IT, not directly from IT alone.

Key Issues

As already stressed, the issue of productivity in the provision in electronic services needs to be carefully phrased. With the vast array of IT available and being developed, new opportunities arise that indeed can be instrumental in bringing about considerable productivity gains in this area. Considerable productivity gains are likely with emerging technologies such as client-server applications or opportunities derived from a technology's ubiquity or portability. Among the policy questions to be addressed are:

- How can policymakers influence IRM officials in realigning their thinking toward a business process redesign (Business Process Reengineering) concept, rather that focus on a hypodermic needle model of IT applications with regard to productivity gains?

- How can policymakers create an innovative IRM operating environment within the Federal government that encourages directed and limited risk-taking such that appropriate IT applications can be explored for productivity gains?

- How can policymakers ensure that certain features of newer IT, e. g., the technology's ubiquity, portability, can be exploited creatively and appropriately within agencies' missions to provide electronic services?

- What mechanisms can policy makers develop to provide motivation and incentives for IRM organizations to implement applications with high potential productivity gains in the provision of electronic services?

- Are policymakers willing to encourage creative and innovative IT applications that may require changes in the hierarchical organizational structures of the past, i. e., often more team work or a more networked organization may be required, as an outcome of the appropriate application of newer IT and desired productivity gains?

These policy issues suggest the importance of identifying factors, or criteria, that might assist agencies determine, in advance, which types of electronic services development offer the best probability for productivity gains.

Implications for Electronic Services Provision

Numerous information resources can be reached today via various electronic means. With many IT applications there is no doubt that a critical mass of users, i. e., citizens, exists. Moreover, certain citizens, e. g., those in remote and geographically dispersed areas, may only be reached electronically in a cost-effective fashion. Increasingly, the only cost-effective means for providing government services may be via electronic delivery.

Productivity gains are likely to be made as the technology or the application process includes features such as ubiquity, portability of IT, and ease of use, that have been poorly explored or have not been explored at all. Such innovative thinking may require more flexible governmental organizational structures, i. e. more team work and networked organizational forms -- all implying at least a modified hierarchical organizational form.

PARTNERING

Various forms of partnering are conceivable, i. e. partnerships can be created with other Federal agencies, with other levels of government (state, county and local), as well as with the private sector (Office of Management and Budget, 1992a. p. III-9). Examples, even though they are sparse, can be cited in each setting. Such cooperation, however, is necessary to maximize the benefits of information and telecommunications technologies. IRM and related IT management efforts cannot be carried out by the Federal government alone. In this sense, the development of the needed technology and software is often a cooperative effort. Often the IT needs of and electronic services provision by the Federal government can be best met by coordinating development activities with the private sector, other Federal agencies, state and local governmental units, or the not-for-profit sector.

Key Issues

Partnering is a necessary evolution in developing and providing electronic services to the public. There are numerous developments in the IRM and telecommunications fields in which partnering makes imminent sense. In the current turbulent world of high costs, globalization, revolutionary shifts in the application of IT (e. g., client-server technologies), there is an increasing awareness of shared purpose at all government levels. Among the policy concerns are the following:

- How can government agencies recognize needs and opportunities to engage in IT and electronic services partnerships -- especially in the evolving national information infrastructure environment?
- Which policy initiatives could be developed that encourage partnering with other agencies, levels of government and the private sector in order to maximize electronic service delivery to citizens?

- What policy initiatives can be devised that create a strategic vision, incentives, and direction for agencies to engage in partnering, as this effort might be a new and possibly only means, to reach citizens electronically?

These policy issues suggest that partnering should become part of most agencies' regular activities in developing and delivering electronic services. This, however, requires considerable rethinking and a considerable degree of organizational flexibility so that partnering with other organizations can become a success.

Implications for Electronic Services Provision

Considerable costs savings can be derived through partnering efforts within the Federal government, but also in cooperation with other levels of government and the non-profit and private sectors. It makes good sense to collaborate in areas that agencies cannot accomplish on their own, but need to be accomplished in order to reach citizens electronically. Such cooperation can be government-wide. Earlier we cited the WEDI (Workgroup for Electronic Data Interchange), a cooperative effort of the health care insurance industry and the Department of Health and Human Services to reduce administrative costs in the U. S. health care system. The preliminary, anticipated savings are estimated at $4 to $10 billion. This example shows how good public policy and good business sense can converge and how industry can cooperate with government as a partner rather than an adversary.

PROCUREMENT PRACTICES

Based on the Brooks Act (40 U.S.C. 759) Federal agencies may not procure IT without the expressed and delegated authority, i. e. Delegation of Procurement Authority (DPA), from the GSA. These regulations are stated in the Federal Information Resources Management Regulations (FIRMR) (41 CFR 201), covering hardware, software, maintenance and related services and they do not include certain classes of systems of some national security agencies. The GSA administrator grants agencies blanket delegations for those resources where the costs over the life of the contract do not exceed $2.5 million. Exceptions to this regulation are possible for specific agencies recognizing "their particular abilities and to provide all Federal agencies the opportunity for the broadest possible blanket procurement authorities."

Typically, an agency must prepare an Agency Procurement Request and the GSA conducts a pre-solicitation review. This efforts is to ensure that the agency's acquisition strategy complies with the requirements of the Brooks Act, i. e. the economic and efficient acquisition of IT resources. The FIRMR requires that the GSA notifies the agency of the disposition within 20 working days, plus five working days for mail delay. Such a disposition may include the grant of the DPA, a request for more time and material to review the agency procurement request, or the denial of the request.

The Federal Property and Administration Services Authorization Act (H.R. 3161), an attempt to improve the procurement process, died in Congress in 1992, but it, or a revised version, is likely to be introduced in the next Congress. The new legislation may also mandate, to some degree, the use of commercial products and to revamp debriefing procedures. OMB had supported a compromise version of HR 3161 because it would have enabled OMB's Office of Federal Procurement Policy to test innovative procurement techniques. This version, however, was not acceptable to all parties involved.

Key Issues

As a policy matter, it is essential that the procurement process for IT is carried out in a timely and speedy fashion. The Federal government has the added burden of having to go through a formal and time-consuming bidding process. Often, given the fast pace of IT development, the technology itself has changed as the procurement process occurs. As a result, the government is unable to take advantage of state of the art technology.

Several measures have been suggested to address the concern of price and performance erosion within an IT-related contract: (1) The contract life should be fairly short, i. e., three years for equipment orders and six years for support and maintenance of installed equipment, and (2) the agency should monitor commercial sales for comparable systems, renegotiate prices and terms if price and performance erosion should occur. These measures work best as an approximating technique and may vary considerably with magnitude of the contract, type of equipment, composition of the vendor-specific market and general economic conditions.

The following policy issues require attention:

- What innovative procurement techniques and procedures can be devised to streamline the procurement process while maintaining adequate external control and review over the process?
- How can life cycle considerations be taken into account so the newest and most appropriate IT can be acquired, even though bidding considerations, procurement procedures, and appeals tend to ignore life cycle considerations?
- Can the procurement debriefing process be revamped (e. g., making post-award debriefings mandatory) as a means for avoiding and reducing protests?
- Can procurement evaluation criteria be made more explicit?

Streamlining the procurement process will not be easy. Increasingly, situations arise in which all parties end up in lengthy legal entanglements, considerably delaying the agency's IT acquisition and playing havoc with any planning process for the delivery of information services.

Implications for Electronic Service Provision

There is every reason to expect the Federal government to use the newest and most appropriate information technologies, software, and maintenance procedures in order to deliver the best possible electronic services to the Nation's citizens. Quite often because of the nature of the procurement process, the government is unable to do so. Very often newer, better and cheaper technology has surfaced within the market and the agency cannot take advantage of it. If an appeal comes about, the process of obtaining the new technology may even take longer. Such an operating environment places the Federal government at a considerable disadvantage over the private sector in meeting demands by the public.

The public sector should be able to meet the services needs of its citizens in a similarly responsive fashion as the private sector does. The existing Federal environment does not create an atmosphere for risk-taking and innovativeness; rather, it stifles such thinking within agencies. The existing procurement process inhibits the acquisition of IT, software and services to provide electronic services to the public in an up-to-date, speedy and responsive fashion. The process needs greater flexibility and responsiveness, and less rules, procedures, and delay.

EDUCATION AND TRAINING

A key policy area requiring a long-range Federal strategy is education and training for government officials in a number of different areas. Training in the use, application, management, and evaluation of information resources requires a range of educational programs. If the government is to move toward the provision of services electronically, there must exist adequate knowledge and skills for how this can be done effectively. Currently, different agencies provide education and training on different topics, e.g., the General Services Administration's Trail Boss program which offers education in the area of IT procurement.

This study identified a host of areas where government officials could profit from ongoing programs of education and training that simply are not available now in any coherent program effort. These areas include:

- Identifying and meeting service needs of the public
- Designing and implementing services within an IRM context
- Deploying new information technologies and electronic service delivery mechanisms, e.g., the Internet
- Life cycle information management
- Information technology and processing standards.

This list is not intended to be comprehensive, rather suggestive of a range of topics for which government officials will need up-to-date information if they are to implement successfully electronic services.

Key Issues

Ongoing programs of staff education and training are essential for the success of all types of organizations. But in the rapidly changing and evolving world of electronic services provision, such programs must be carefully developed and implemented to meet specific objectives. Some of the policy issues in this area include:

- Who or which agency has responsibility for coordinating IT and electronic services provision education and training programs within the government?
- Should Congress provide funds with program legislation to support agency education and training activities related to implementing that legislation? Or should such initiatives be government-wide?
- How can agency information management innovations be rapidly diffused across government?

- What incentives/rewards can be provided to officials that participate in educational programs? For example, should the government implement a certification process to insure that agency officials stay up-to-date with new knowledge and continuously enhance their skills and competencies?

In short, these issues ask: who is responsible for education and training, how should education and training programs be supported, and how can the public ensure that agency officials are gaining new knowledge, skills, and competencies?

Implications for Electronic Services Provision

In our discussions with a range of government officials, a consistent concern was how to learn about new IT applications, how to better utilize IT to meet agency mission, and how they might pay for such education and training. The current process of Congress requiring an agency to develop certain programs that require learning new IT skills without assisting the agency to acquire the IT knowledge and skills necessary to implement the program successfully is illogical and unworkable.

One cannot expect government officials to design and implement successful electronic services if they are unaware of or lack personnel with knowledge in using new information technologies, in implementing strategies to use the technology to support services, and lack the prerequisite skills to determine how best to plan and administer such services. A massive and pervasive on-going *program* (not one-shot efforts) of education and training throughout government in the area of the design and implementation of IT for services provision is essential.

SERVICE ATTITUDE IN GOVERNMENT

A number of Federal agencies appear to not see themselves as providing services to the public, but rather completing certain tasks and activities as ends unto themselves. The recent results of the national elections, comments from participants in our various data collection activities, and first-hand experiences of study team members in completing this report suggest that there is increased recognition that government agencies frequently lack a service attitude in their dealings with the public, with other agencies, and with Congress.

President-elect Clinton campaigned on the slogan "putting people first," and one can expect that agencies will need to re-assess how they will accomplish this objective. Indeed, Total Quality Management (TQM) as a means of improving services to an organization's customers, appears to be gaining much attention throughout both public and private sector organizations. Such approaches, however, assume that (1) the organization sees itself as providing services, (2) one of the reasons for the existence of the agency is to serve the citizen, and (3) there is a desire on the part of organizational members to identify "customer" service needs and develop a service perspective in meeting those needs.

Key Issues

As a policy area, it is essential that those agencies that, by statute, provide services to the public see themselves as service-oriented and identifying/meeting "customer" needs. Such a perspective is critical to the overall success of providing any type of services – be that electronic or not. Given this context, the following policy issues require attention:

- Should there be government-wide guidelines that define and operationalize the importance of a services and a "customer-orientation" attitude and suggest strategies that encourage agencies to be more responsive to the public's service needs?
- To what degree does enabling agency legislation recognize the role of agencies as "providing services" to the public?
- Are there agency guidelines and policies that define and promote a customer-oriented, service perspective within the agency?
- What assessments are done to determine the degree to which agencies identify and meet clientele service needs?

A key concern within this policy area is the degree to which one can "legislate" that agencies take on a more service oriented perspective in their dealings with the public. Long standing government attitudes and organizational cultures that do not support a services perspective can be difficult to change.

Implications for Electronic Service Provision

Currently, a number of Federal agencies that are, by law, required to provide a range of services to the public do not see themselves as being in the service business. Policy initiatives that require agencies to provide existing (ineffective) services in electronic format will not improve that service. Indeed, a first step may be an attitude adjustment on the part of some agency personnel that part of their job is identifying and meeting public service needs, and doing it in a timely, courteous, and effective manner. Initiatives such as the General Services Administration's "Service to the Citizen" may suggest strategies for how a "services perspective" can be promoted in the government.

A purpose of the Paperwork Reduction Act of 1980 (P.L. 96-511) was to (Section 3501 (5)) "ensure that automatic data processing and telecommunications technologies are acquired and used by the Federal Government *in a manner which improves services delivery* [authors' emphasis]. . . Little assessment has, in fact, occurred; inadequate attention has been given to this aspect of the Paperwork Reduction Act. Improved provision of government electronic *services* cannot occur without a clear and pervasive understanding government-wide of what the term "service" entails and how the quality of those services will be assessed.

COORDINATING THE PACE OF POLICY DEVELOPMENT

A key policy area that requires attention is the apparent disassociation between advances in IT developments, agency efforts to manage and use the technology, and a policy framework that provides guidelines for the agencies to exploit the IT for effective services provision. The policy framework for managing IT and electronic services provision is woefully out of date. Policies and guidelines that agencies need have yet to be developed, are only now beginning to be considered, and some relevant policies have not been implemented or enforced successfully.

For example, Title 44 U.S.C. dealing with the Government Printing Office's Depository Library Program is recognized by most observers as seriously flawed for the electronic age; the reauthorization of the Paperwork Reduction Act has been stymied for the last three years; the process for revision of OMB Circular A-130 has been lengthy and, as this report is written, still has not been finalized.

Government needs a better process that brings together information policymakers to solve problems and clarify key issues. It is likely that frustration with the existing process encouraged the Solomon Island Group of agency officials (Kadec, 1992) to develop policy guidelines on their own. Federal information policy development has not kept pace with either IT development or agency needs.

Key Issues

Coordinating the pace of policy development will require the government to review a number of issues that continue to require attention:

- How can Congress and the Executive information policymaking agencies better coordinate their efforts to provide timely, clear, and enforceable guidance in the management of IT and electronic services?
- What mechanisms can be established to obtain better involvement in information policy development by the public, agencies, and the non-profit and private sectors?
- How might the development of Federal information policy better match the pace of IT development and application?
- What is the role of Federal IRM in developing and coordinating information policy?

Especially important is to make certain that users, and potential users of electronic services, participate in the various policy debates. These policy issues suggest the need for developing new structures and mechanisms for linking information policy development with the day-to-day issues actually being addressed by agencies.

Implications for Electronic Services Provision

To a large degree, the existing Federal information policy system inhibits agencies from developing services that might be provided electronically. There is considerable confusion about existing policies that guide the development of such services, e.g., costing electronic services or understanding which standards are to followed in what situations. Such confusion and ambiguity can act as an inhibitor for agency experimentation and risk taking – as well as inhibiting basic compliance by the agencies.

Further, the pace of new developments in computers, telecommunications, networking, and IT management is much quicker than the pace at which the Federal government develops policy guidance for the agencies to operate in the electronic environment. While some efforts have been made by agencies to develop their own information policy guidelines (Kadec, 1992), a number of agencies have been effectively "left behind" in the transition to the electronic age.

RESOLVING ISSUES

The above topics include a range of policy issues requiring resolution. Figure 7 provides a summary of the key issues identified in this section of the report. A review of these issues suggests the expanse of topics and concerns they cover. Moreover, they suggest that any concerted effort to improve Federal information policy and management for electronic service delivery will have to consider, and coordinate, a range of issues if it is to be successful. This figure is not intended to be comprehensive, indeed, the study team identified a number of topics that require further research (see Appendix A).

The issues also suggest that there is a lack of vision for the role that the government should play in the provision of electronic services, a lack of vision in how IT and the management of that technology can better serve the public's needs, and there is no vision for how the information policy of this Nation can be brought together, coherently, to support electronic services provision. In the last section of this report we discuss the importance of developing this vision and recommend that a government initiative be undertaken to realize such a vision.

Figure 7
Summary of Key Issues

1. MODERNIZING THE GOVERNMENT'S INFORMATION INFRASTRUCTURE

- What constitutes a "modern" and "effective" government-wide information infrastructure?
- Should the government be able to provide a basic level of information infrastructure that can be drawn on by other agencies or are agencies expected to develop their own information infrastructure? What level of compatibility should be expected across agency infrastructures?
- Is OMB-OIRA responsible for ensuring the development of a government-wide information infrastructure (under the Paperwork Reduction Act) – if not OMB-OIRA, then which agency is responsible? How successful has OMB-OIRA been in this area and to what degree are additional policy guidelines required?
- How can adequate funds be obtained, authorized, and effectively managed to support the development of a modern and effective government information infrastructure?

2. LINKING CITIZENS TO THE GOVERNMENT ELECTRONICALLY

- What type of technology and under what type of administrative structure is most appropriate to serve as a national electronic network?
- How can existing Federal networks (e.g., FTS 2000, NSFNet, etc.) be interconnected and linked to the Internet or other electronic networks?
- Can the NREN serve as the national electronic network for linking government with the citizenry?
- What is the role of libraries in providing support for the national electronic network and how might they best serve as intermediaries in linking the public to the government electronically?
- Can a single, easy-to-use interface be devised which provides effective access to a range of electronic government services and products?

3. INCENTIVES FOR EFFECTIVE INFORMATION TECHNOLOGY MANAGEMENT/SERVICES PROVISION

- What policy initiatives could be developed to encourage agencies to experiment and innovate with the provision of services electronically?
- What policy initiatives could be developed to remove the disincentives for agencies to provide services electronically?
- Has Congressional and Executive branch oversight/regulation inhibited agency risk taking, innovation, and the development of a strong service perspective?
- Can specific cost savings or other benefits be demonstrated by agencies that provide services electronically?

4. REDEFINING IRM FOR ELECTRONIC SERVICES PROVISION

- How might the government define and implement a broader and more far-reaching vision of IRM?
- What measures can be taken such that agencies develop an overall IRM framework with a deliberate service orientation?
- How can funds be made available within each agency for employees to participate in IRM training and education? How might additional attention in these programs be given to security and privacy issues?
- How can mechanisms be created that encourage external partnerships (with other levels of government, as well as with the non-profit and private sectors) in reaching citizens electronically?
- How can mechanisms be created that reward experimentation, innovation and provide incentives for the IRM organization?
- How can mechanisms be created that keep IRM managers abreast of major developments in the IRM and telecommunications fields (e.g., paradigm shifts such as business process redesign)?
- How can a mandate be provided to agency heads to provide electronic services where feasible and appropriate via a Federal government information infrastructure?
- How can a deliberate effort be created that entices agencies to join government-wide and other national information infrastructure configurations?
- What are IRM managers' responsibilities to safeguard the privacy and security of government information -- for both the government and the individual -- in a networked environment?
- How might a governmental entity be created or empowered with effective jurisdiction over all branches of government and all agencies regarding management of information infrastructure?

5. COORDINATION AND AGENCY ROLE (RE)DEFINITION

- How can a concentrated and directed commitment to IRM be instilled in agency heads?
- What sort of mechanisms might exist to *enforce* an IRM orientation and commitment in agency heads, IRM managers, and appropriate others?
- What mechanisms and incentives can be created to bring about an IRM and telecommunications reorientation such that agency heads and IRM and telecommunications managers think and operate not just toward their own agency-internal benefits, but that they think and operate in terms of services and joint, cooperative and government-wide strategic efforts?
- What organizational and government-cultural changes might be needed to bring about a flexible, dynamic and networked IRM and telecommunications organization?

- Can senior agency IRM officials and basic IRM ideas and concepts be made more visible and significant in the decision making process?

6. PRODUCTIVITY IN INFORMATION TECHNOLOGY MANAGEMENT IN ELECTRONIC SERVICES PROVISION

- How can policymakers influence IRM officials in realigning their thinking toward a business process redesign (Business Process Reengineering) concept, rather that focus on a hypodermic needle model of IT applications with regard to productivity gains?

- How can policymakers create an innovative IRM operating environment within the Federal government that encourages directed and limited risk-taking such that appropriate IT applications can be explored for productivity gains?

- How can policymakers ensure that certain features of newer IT, e. g., the technology's ubiquity, portability, can be exploited creatively and appropriately within agencies' missions to provide electronic services?

- What mechanisms can policy makers develop to provide motivation and incentives for IRM organizations to implement applications with high potential productivity gains in the provision of electronic services?

- Are policymakers willing to encourage creative and innovative IT applications that may require changes in the hierarchical organizational structures of the past, i. e. often more team work or a more networked organization may be required, as an outcome of the appropriate application of newer IT and desired productivity gains?

7. PARTNERING

- How can government agencies recognize needs and opportunities to engage in IT and electronic services partnerships -- especially in the evolving national information infrastructure environment?

- Which policy initiatives could be developed that encourage partnering with other agencies, levels of government and the private sector in order to maximize electronic service delivery to citizens?

- What policy initiatives can be devised that create a strategic vision, incentives, and direction for agencies to engage in partnering, as this effort might be a new and possibly only means, to reach citizens electronically?

8. PROCUREMENT PRACTICES

- What innovative procurement techniques and procedures can be devised to streamline the procurement process while maintaining adequate external control and review over the process?
- How can life cycle considerations be taken into account so the newest and most appropriate IT can be acquired, even though bidding considerations, procurement procedures, and appeals tend to ignore life cycle considerations?
- Can the procurement debriefing process be revamped (e. g., making post-award debriefings mandatory) as a means for avoiding and reducing protests?
- Can procurement evaluation criteria be made more explicit?

9. EDUCATION AND TRAINING

- Who or which agency has responsibility for coordinating IT and electronic services provision education and training programs within the government?
- Should Congress provide funds with program legislation to support agency education and training activities related to implementing that legislation? Or should such initiatives be government-wide?
- How can agency information management innovations be rapidly diffused across government?
- What incentives/rewards can be provided to officials that participate in educational programs? For example, should the government implement a certification process to insure that agency officials stay up-to-date with new knowledge and continuously enhance their skills and competencies?

10. SERVICE ATTITUDE IN GOVERNMENT

- Should there be government-wide guidelines that define and operationalize the importance of a services and a "customer-orientation" attitude and suggest strategies that encourage agencies to be more responsive to the public's service needs?
- To what degree does enabling agency legislation recognize the role of agencies as "providing services" to the public?
- Are there agency guidelines and policies that define and promote a customer-oriented, service perspective within the agency?
- What assessments are done to determine the degree to which agencies identify and meet clientele service needs?

11. COORDINATING THE PACE OF POLICY DEVELOPMENT

- How can Congress and the Executive information policymaking agencies better coordinate their efforts to provide timely, clear, and enforceable guidance in the management of IT and electronic services?

- What mechanisms can be established to obtain better involvement in information policy development by the public, agencies, and the non-profit and private sectors?

- How might the development of Federal information policy better match the pace of IT development and application?

- What is the role of Federal IRM in developing and coordinating information policy?

VI. RECOMMENDATIONS

INTRODUCTION

This study concludes that the Federal government must undertake a concerted, major effort to build a modern information infrastructure to serve its own internal information resources management needs, and more importantly, to serve the provision of services to its citizens. The Federal government must also implement a management and policy framework that guides and directs a re-invigorated service orientation. Finally, the Federal government must be involved, on a partnership basis with other levels of government and private sector organizations, in the development of a national information infrastructure. Without a modern technology infrastructure and a national information infrastructure, the Federal government will be relegated to a second-class organization operating merely at the periphery of society in the twenty-first century. It is imperative that the Federal government positions itself, strategically plans, and commits to a key role in the national information infrastructure, which will enable meaningful provision of electronic services to all citizens.

The previous sections of the report suggest that there are opportunities for the Federal government to deploy a modern information infrastructure and to use this infrastructure for the provision of electronic services. In fact, the range of opportunities and the extent of possible approaches to move forward are numerous. This section offers a broad vision of the Federal government in its role as an electronic service provider. Such a vision is essential if the Federal government is to take a leadership stance in creating and flourishing in this evolving electronic future.

Citizens, businesses, governments at all levels, educational institutions, professional groups and other organizations across the United States are becoming electronically interconnected, integrated, and interdependent. New information technologies create a higher demand for multiple and efficient connections among communication networks across the United States and worldwide. Our nation is a vital component of a globally interconnected world in terms of communication, business, economics, finance, transportation and other realms. Global network interconnections are reflective of an emerging, world-wide electronic infrastructure.

Today we expect live coverage of major world events such as the Gulf War or the humanitarian assistance provided in Somalia. Citizens in the United States and many other nations expect information to be available anywhere, quickly, and at all times. Our citizens are aware that information can be delivered electronically and they expect such electronic information delivery where possible. Indeed, the public expects a certain immediacy and ubiquity of services in every realm of society.

The public also expects high service levels and quality in its interaction with service providers. This includes, for example, rapid -- if not immediate -- turn-around in approval of credit card purchases, automatic payments and electronic funds transfer, 24-hour teller machines, seven-day-a-week customer services via toll-free telephone numbers and fax machines, and many other services available from a variety of locations, even from the home. Many members of the public are currently using electronic services provided by the private sector, and they now expect the same level of service from their governments, Federal, state, county, or local. Yet, in many interactions with the Federal government, they instead face bureaucratic delays, endless paper forms to complete, and a complete lack of customer-centered service.

The Federal government needs to change to meet the public demand for services at the customer's own convenience. This implies that Federal service provision must be rethought and redesigned starting from the publics' needs. Federal government services need to display a thorough and deliberate customer orientation. In this sense government services should be given where and when the public wants them rather than where and when the government wants to provide them.

Telecommunications coupled with computers can deliver electronic services wherever there is a telephone and a computer. Today, many citizens are connected to national telecommunications and computer networks in their homes via cellular telephones, pagers, conventional telephones, electronic mail, fax machines and other devices. Cable television connects the vast majority of citizens to entertainment, information, and others services. The potential for exploiting these technologies is just being tapped. Citizens take the services offered using these communication media and devices for granted. With the appropriate use of information and telecommunications technologies, our government can provide faster, better, safer, more courteous, and convenient services.

All of these developments place new demands on government, and the government has been slow and unresponsive in addressing these demands. The Federal government must engage in a major re-examination of electronic services provision as our society, and for that matter, the world becomes more crowded, more complex, yet more tightly connected via information technologies.

The resulting demands on government are substantial in terms of the scope and quantity of services, especially electronic services and delivery. Enormous economies of scale, cost savings and productivity gains can be achieved by deliberately developing a Federal government information infrastructure that is linked to a private sector and not-for-profit national information infrastructure. Such an infrastructure, and the management and policy frameworks to guide electronic provision of Federal government services are necessary preconditions if these services are to be available to the citizens.

This Recommendations section first cautions against the current undirected evolution of electronic services. We then present a vision statement of the Federal government as an electronic service provider. This vision is the deliberate effort by the Federal government to design, build, and provide electronic delivery of services. To realize this vision, we recommend that a "Dynamic Government Initiative" is required. There are two primary components to this Initiative: technology and management. Technology concerns the information infrastructure of the Federal government upon which rests all service delivery. Management concerns the crucial and critical elements relating to social, organizational, behavioral, and resources deployment that must be addressed to exploit the technical possibilities offered by the infrastructure. Finally, we offer a number of specific recommendations that should be considered by Congress for implementation. These recommendations are meant to further operationalize and specify what needs to be done to implement the Dynamic Government Initiative. However, first the cautionary note.

AVOIDING "NATURAL EVOLUTION" OF PROVISION OF FEDERAL ELECTRONIC SERVICES

With minimal or piecemeal intervention by Congress and the Executive branch in designing a Federal information infrastructure that links government information resources management with the provision of electronic services, largely undirected evolution and non-coordinated deployment of information and telecommunication technologies is likely to occur. This will have negative consequences in Federal attempts to deliver services electronically. Some agencies will attempt to provide policy guidance and direction, e.g., OMB-OIRA, GSA, OTA, and the National Archives. Some individual "good example" agencies such as the USGS will move government toward the networked environment. But the lack of a government-wide vision and coordinating agency limit the effectiveness of this approach as a means for the effective provision of electronic services.

This evolution is largely an extension of the existing situation – decentralized, agency-based and undirected deployment of information and telecommunication technologies. Thus, the initiatives and directions that any given agency might pursue will vary widely across government. There is likely to be little coordination among the various agencies in terms of the nature of the electronic services to be provided, the integration or linking of these services, or the uses of specific types of information technologies. Thus, citizens would be expected to know how to use a range of different technologies, how to connect to those technologies, and determining what agency provides what services using what technologies.

Some agencies, as we see now, may take a very proactive leadership position in developing electronic delivery of services. Other agencies are likely to be "left behind" as they struggle to obtain a modern information infrastructure and/or learn how to apply that infrastructure for the provision of services. Some agencies do not know what is potentially possible with the effective use of IT in managing and delivering electronic services. Still other agencies could float along within a stream of whatever policy and technology events it encounters. Although the agencies are likely to survive within this context, they will not move rapidly or effectively into electronic services provision. The consequences of this evolution on citizens is manifold. Users of government services will be left "on their own" to determine how best to access disparate electronic services, and the gulf between the information "haves" and the "have-nots," the service "haves" and "have-nots" will continue to grow.

A VISION FOR THE ELECTRONIC PROVISION OF GOVERNMENT SERVICES

The Federal government, in order to deliver its services to the citizens of the United States, provides quality services using electronic delivery mechanisms; deploys a modern information infrastructure that serves as the foundation for services provision; participates in and contributes to a national information infrastructure that provides ubiquitous connectivity for all citizens, re-orients Federal agency management practices to adopt a responsive customer-service attitude in the provision of quality services to citizens; promotes experimentation and risk-taking; and rewards excellence in service delivery and innovative managerial and technological applications. This vision enhances government's provision of electronic services, increases government productivity and efficiency, and promotes the public's general welfare and quality of life. To accomplish this vision, the Federal government implements a dynamic initiative that includes components of technology and management practices, and it develops comprehensive and appropriate policy that guides and directs the execution of this initiative.

THE NEED FOR A DYNAMIC GOVERNMENTAL INITIATIVE

This initiative is one in which the government develops a vision (such as that offered above) for the electronic provision of government information and services and develops policy and strategy to realize that vision. In this initiative, there is a coordinated strategic plan to modernize the information infrastructure of the government, link that infrastructure to the public and private sectors, and design and implement a range of electronic services to meet the public's needs. A management component of the initiative addresses essential elements that must accompany the deployment of the infrastructure to realize the vision. We identify four major management components:

- Redesign of IRM
- Promote partnering and collaboration

- Provide incentives and rewards for innovation
- Establish a commitment to citizen-centered, quality services.

A new policy framework, building on existing policy or developing needed policy, will guide these developments and provide the context for the initiative.

In this initiative, lead agencies would provide guidance and coordination government-wide to move the other agencies into the electronic environment. Agencies would be redesigned from a customer perspective. Employees of such a redesigned agency are externally focused on citizen needs, and they believe in adding value to the organization with each service they provide. This change requires substantial rethinking of the appropriate organization structure, function and possibly the mission of the agency.

Government must become more flexible within its structure and responsive to citizen needs. Some of the needed policy changes to accomplish this will seem drastic and novel for many governmental units. Yet there are successful examples in the private sector, other governmental levels, and in some Federal agencies that display the characteristics we are describing. Information and telecommunications technologies act as enablers and have the potential for flattening the agency organization chart, creating a new flexibility within a so-called networked organization, i. e. more teams, task forces or ad hoc groups cutting across traditional functional, hierarchical lines, and organizational boundaries. Currently, much of the Federal bureaucracy seems to suffer from a sort of administrative arthritis, characterized by slowness and little agility in responding adequately and promptly to citizens' needs.

The Dynamic Governmental Initiative for designing and administering the provision of electronic services can be accomplished. Both the technology and management components are equally important. Without the information infrastructure, electronic services will not be coordinated and the intended productivity benefits will vanish. Lacking the management component, the Federal government will continue business as usual, and the IT will merely frustrate citizens more quickly.

A Federal Electronic Network

The government is in the business of distributing services and products nationally. In attempting to distribute these services and products electronically it is essential that the government is electronically connected to the citizenry. Any vision of the future role of the Federal government must be based on an electronically interconnected nation in which service transactions between the government and the public occur instantly, effectively, seamlessly, and regardless of geographic location

A "backbone" national Federal telecommunications network should be built upon existing components including agencies' LANs and WANs, FTS 2000, the Internet/NREN, and a national interactive video system yet to be developed. Such a backbone would allow for the support of common electronic services, such as voice, data, and image transmission, among all agencies and with the public. Within such a framework the GSA in cooperation with other agencies could identify infrastructure opportunities such as transparent broadband ISDN, highest speed data communications, standard electronic mail, and enhanced voice services. All of these technologies and services should be available to all agencies in the same fashion as every government agency is now able to telephone other government agencies and members of the public. The importance of infrastructure has been discussed previously, and the deployment of a national Federal telecommunications network is essential to a robust infrastructure.

A Federal telecommunications network, that includes FTS 2000, could serve as a major component in building a national information infrastructure. FTS 2000 is generally well-designed and conceived in spite of current and past criticism (Government Accounting Office, 1992d). An expanded FTS 2000 in conjunction with the evolving NREN and in partnership with private sector firms within the telephone, computer networking, and cable industries provides the link to reach the citizenry electronically. Private sector firms in these industries have developed plans to deliver a wide range of service via the installed base of telephone wires and cable television. Many citizens today are already electronically connected via the Internet, CompuServe, GEnie, Prodigy, and other electronic networks and services. When looking at the larger picture of these and other developments, one quickly ca envision an electronically connected nation.

It is possible to envision that any citizen could have an electronic address. Could the forthcoming NREN become accessible to every citizen just like telephone service? Could citizens then reach their government directly and electronically? Could government agencies reach citizens electronically? Would every locally switched telephone company exchange become a node within such a network? Such developments would imply universal access to publicly switched networks. Our central concern is that the Federal government should play a key leadership role in coordinating these developments. If government does little or nothing to meet the new challenges in terms of electronic service delivery, then the existing gulf between government and similar business services will only widen, resulting in yet additional problems pertaining to government ineffectiveness and its inability to identify and meet public service needs.

The vision of an electronically connected nation implies new roles and responsibilities for organizations. One important new role can be filled by the library community, which can act as intermediary in assisting public access to this network. Libraries are positioning themselves for networked environment. They will have public access nodes on the network, and librarians could be trained to assist the public identify, locate, and use services provided electronically by the government. It is unlikely that in the near term all citizens could be both connected and knowledgeable about what to do with such a connection. The role of intermediaries such as librarians is essential to insure that there is a level playing field for *all* members of the public to participate in the access to and provision of electronic government services.

This effort, and especially the demonstration of a national will to strategically pursue these ends, will not be easy in tight budgetary times and with rapid technological advancements. It will take a joint effort among Congress, the public and private sectors, and the Executive Branch to form a consensus before this vision can be implemented. This effort must be initiated from the highest levels of government. It must be pursued if the United States is to remain competitive and for the government to become an organization more responsive to the needs of its citizenry.

Applications of information and telecommunications technology within a modern information infrastructure can serve as major tools in providing government services in a responsive, timely, cost-effective and above all, citizen-oriented fashion. But the success of many agency programs -- and the degree to which they improve the quality of life for the public -- will be dependent on a high level of government responsiveness and electronic connections with the citizenry through a national electronic network that links all segments of society.

A Management Framework

The Dynamic Government Initiative requires more than just the technology to deliver the services. Equally important, the government must adopt management practices to exploit the potential offered by the technology. There are four innovative practices within a management framework for the electronic provision of Government services.

Redesign IRM for Electronic Services

In a Dynamic Governmental Initiative, a focus point for the development of electronic government services is a reinvigorated and enhanced model of information resources management in the government. This approach encourages IRM managers to become the lead units within government to design, coordinate, and implement electronic services provision over a Federal network. A government-wide coordinator for IRM could be established in OMB-OIRA or some other Executive agency. This agency would have a legislative mandate to operate and coordinate the electronic provision of government information and services.

IRM is re-defined to be a service-oriented position that coordinates the management of human and technical resources to (1) develop a modern information infrastructure, (2) teach agency officials how to exploit this infrastructure, (3) coordinates infrastructure development and applications with other agencies, and (4) uses this infrastructure to deploy a range of innovative electronic services.

To be successful, Federal IRM managers must be elevated to upper administrative positions in the agencies that have responsibility for technology planning and procurement, training and education, public information services, library operations, life-cycle management of agency information, identifying and meeting clientele service needs, and provision of those services to the public. IRM would be the central unit in each agency to manage a much broader range of information-related activities than they currently do.

Either Congress could pass a new Paperwork Reduction Reauthorization Act that outlines this approach, or OMB-OIRA could issue policy guidelines that redefine IRM as a services-based approach for meeting internal agency information needs and external service needs of the public. Such policy would require granting additional responsibilities, resources, and oversight power to an agency such as OMB-OIRA to redesign IRM. In this redesign, IRM would become a mechanism to establish the government-wide information infrastructure/network and encourage agencies to participate in that network in the electronic provision of services.

Promote Collaboration-Partnering

Partnering is the process whereby multiple parties, i.e., intragovernment agencies, intergovernment agencies (at the Federal, state, county, and local levels), and the non-profit and private sectors form collaborative ventures in order to deliver constituent services. In this joint venture scenario, components of government (inter and intra), and private sector companies work together for the purpose of service provision.

Partnerships exist in many forms. For example, government agencies and the private sector may work together to develop IT (such as the InfoCal kiosk system), government agencies may contract with the private sector to have the private sector perform certain services (such as EBT computer systems development and maintenance), government may completely pass certain services to the private sector (such as Maricopa County, Arizona has done with its sanitation collection services), and governments may work in unison with the private sector to provide services (such as the proposed Medicaid/Medicare WEDI project).

The current policy framework for contracting out government services can be found in OMB Circular No. A-76, and a recent policy letter from the OMB Office of Federal Procurement Policy, Policy Letter 92-1 (Office of Management and Budget, 1992d). Neither document provides a clear and unambiguous direction for Federal agencies with respect to contracting out agency services. Were this form of partnership to be used as the basis for the development of a national Federal electronic network these policy instruments would have to be extended, detailed, implemented, and enforced. While the issue of what services can be contracted out still is not as clearly defined as it should be, the issue of whether contracting out serves the public good has been addressed (Savas, 1982; Osborne and Gaebler, 1992; Fitzgerald 1988; and Donahue, 1990) – and there have been numerous success stories.

Additionally, there are no policy guidelines in place to guide Federal agencies through the establishment of collaborative ventures with the private sector or other levels of government. Currently, relationships, roles, and responsibilities "unfold" as partnerships progress. Frequently, the Federal procurement process slows joint ventures to a standstill, discouraging agencies from pursuing these collaborations.

For partnership and collaboration to be effective, Federal policy and procedures are needed to address these types of questions:

- How does government identify which services to partner?
- What collaborative model is appropriate for what service?
- What is the role of government in each type of model?

Accountability, performance, and consonance with the public's interest should be key concerns in using partnership as a basis for developing electronic services provision. Moreover, policymakers must consider these four factors:

- Are there sufficient comparative measures that would enable government agencies to determine the cost-effectiveness and benefits of partnering/contracting out?
- Is there adequate competition in the private sector conducive to a competitive bidding and to ward off entrenchment?
- Is the agency adequately prepared to effectively monitor service contracts? To move from in-house service provision to a collaborative model certain agency organizational changes must occur, i.e., moving from service provider to service monitor. Are agencies ready to "steer?" (Osborne and Gaebler, 1992).
- Are the goals of the private contractor the same as those of the public interest? There are different clienteles served by the public and the private sector. "The burden of public institutions is precisely that they are often the services of last resort; the freedom of private institutions consists in part of their ability to select the most desirable client populations" (Starr, 1987, p.6).

The Federal government must be aware of the possible number of vendors for the service. Limited competition for government contracts could lead to higher costs (Goodman and Loveman, 1991, p. 34). In this vein, governments must take care not to move from a governmental service monopoly to a private sector service monopoly.

Partnering and collaboration are particularly suited in electronic services. The nature of IT is one of interconnection and interdependence. Yet any partnering efforts by the Federal government needs to be adequately managed to serve the public interest.

Provide Incentives and Rewards for Innovation

The Dynamic Governmental Initiative for the provision of electronic services envisions a number of approaches to encourage incentives, innovation, and rewards for agencies that do innovate. One approach could create experimental units within at least major agencies, and provides at the same time realistic incentives for IRM and telecommunications managers to experiment with the provision of electronic service. Agencies could develop proposals for experimental and innovative approaches to modernize their information infrastructure and provide electronic services to the public. These proposals would be evaluated by an agency, perhaps GSA, which would make awards from a legislatively mandated pool of monies to support such innovative efforts.

An interagency working group, organized perhaps on the model of the FIRMPOC, would serve as an advisory body and make recommendations to coordinate these efforts. The good examples and "success stories" would be publicized throughout the government, participants in these successes would work with other agencies to transfer the knowledge, and additional resources would be made available to those agencies that take on a mentoring role with other agencies. The creation of such experimental units coupled with incentives that encourage experimentation could trigger a substantial effort in developing new and successful means for the provision of electronic services to the public.

Other approaches might be to include funding in start-up programs for experimentation with new technologies, with methods to deliver electronic services, or with identifying citizen service needs in an electronic environment. Individual agencies might maintain resources for innovative programs and experimentation.

Incentives and rewards must be provided to agencies and individuals to take risks and experiment with new technological or managerial approaches in the delivery of electronic services. Incentives can also be provided to encourage partnering, for designing electronic services that are especially cost-effective, or for services that identify and meet citizen service needs. Theses incentives and rewards can be both tangible and intangible. Individual job promotions, cash "innovation awards," increased visibility for the agency, retaining income from the services to support the service, are among some of the possible incentives available.

Establish A Commitment to Citizen-Centered, Quality Services

For the Federal government to use IT effectively to deliver services, it must adopt a fundamentally different attitude toward service provision. Private sector organizations understand the importance of serving their customers -- without customers these organizations will fail. Total Quality Management is an important response to this understanding of putting the customer first. This, however, is not the dominant service attitude of the Federal government.

Service to the citizens must be the motto for electronic service provision by the Federal government. Information technology merely enables, but offers no guarantee of effective and responsive service delivery. Putting the citizens first means understanding their needs, establishing programs and services that meet these needs, and developing the appropriate delivery mechanisms to fit the service and the citizens' needs. No longer is it necessary to provide a "one size fits all" service. Yet to develop customized services driven by citizen needs, the Federal government, its agencies, and their staff must adopt a new service mentality.

Quality services are also demanded by the citizens. Just as we desire quality products for the money we spend, as taxpayers the citizens want to know that they are receiving their money's worth. Quality services can be characterized as reliable, timely, user-friendly, appropriate to the recipient, and available from diverse sources. Quality services are a natural outcome if service to the citizens is the primary goal.

Changes in service attitude will not occur spontaneously nor immediately. In some respects, this is calling for a change in organizational culture of the Federal government. While organizations can restructure themselves by the decisions of an executive, organizational cultural change must be nurtured. There must a reason to change, and incentives and rewards are one way to nurture the change. This change must be led from the top levels of government. President-elect Clinton's message of "Putting People First" can be a building block of cultural change in the Federal government.

RECOMMENDATIONS

The preceding material in this report suggests numerous possible recommendations that could improve the government's deployment of a modern information infrastructure and the provision of electronic services. The study team considered a pool of possible recommendations and assessed them against the following criteria:

- Cost-effectiveness
- Improvement on the quality of government services
- Responsiveness to citizen needs
- Need for new legislation or Executive regulations/policy guidelines
- Potential penetration/reach of electronic services to the citizenry
- Feasibility
- Innovative use/application of electronic services
- Relative contribution toward the emergence of a national information infrastructure.

Upon examination of the final resulting recommendations, they tended to cluster in certain general areas. These clusters and specific recommendations are described below.

Recommendation Cluster # 1:
Build a National Information Infrastructure

1. Connect the government of the nation electronically to its citizenry.
2. Expand FTS 2000 with a view toward becoming part of the Internet/NREN and the national information infrastructure.
3. Expand private sector and non-for-profit organizations' vision of the Federal government's place and role in the shaping of a national infrastructure.
4. Develop a modern information infrastructure within the Federal government.
5. Identify potential sources of funds for the formation and building of an information infrastructure.

Recommendation Cluster # 2:
Establish Innovative Information Policy

1. Coordinate information policy and information policy development from a single office, such as the Vice-President of the U.S, or from a single agency such as OMB-OIRA.
2. Pass new and innovative information policy that requires and promotes electronic services provision in such instruments as PRA, GPO WINDO, and the creation of an information infrastructure.
3. Pass policy instruments that are more visionary with regard to the information infrastructure and electronic information services delivery.
4. Provide mechanisms that accommodate for the fast pace of technological developments in the information and telecommunications technology areas when developing policies.
5. Clarify the "undue burden" clause in the PRA to allow for user evaluations of new electronic service delivery methods.
6. Provide clear and detailed policy and guidelines to agencies for the pricing of electronic information services and products.

Recommendation Cluster #3:
Redesign IRM and Telecommunications Applications

1. Encourage inter-agency working groups and coordination of IRM and telecommunications efforts.
2. Create an office, possibly within OMB-OIRA, with some government-wide mandate and enforcement oversight to reinvigorate IRM and telecommunications applications.
3. Create a mechanism to assure that agency heads demonstrate deliberate commitment to the IRM, telecommunications applications, and the creation of a national infrastructure effort.

4. Promote intergovernmental, intragovernmental and government-private sector partnering and cooperative efforts.

5. Provide incentives for agencies that do develop innovative IRM practices and provision of electronic service.

Recommendation Cluster #4:
Promote the Development of Electronic Services

1. Investigate government-wide which services can be provided electronically.

2. Investigate if there are specific target audiences that are especially attractive to be reached electronically and that would be difficult to reach otherwise.

3. Create a central 'Electronic Benefits Delivery office within the Federal government, as this effort is duplicated many times over in other agencies.

4. Create a central administrative unit to coordinate agency kiosk electronic services.

Recommendation Cluster #5:
Encourage Agency Innovation and Experimentation

1. Establish an innovative technology applications fund available to each agency as a percentage of the agency's budget (see, for example the Corporate Capital Investment Fund in the Department of Veteran's Affairs).

2. Establish the commitment toward innovative use of information and telecommunications technology in order to encourage experimentation and innovation, at the highest administrative levels.

3. Initiate an 'Innovative Information Technology for Electronic Services Program,' possibly analogous to the GSA's '1000 by 2000 Program.'

4. Allow agencies to keep a percentage of funds saved through innovative application of IT. These funds should become part of a permanent revolving fund for innovative applications of IT within that agency.

Recommendation Cluster #6:
Coordinate and Enforce Information Technology Standards

1. Coordinate the choice and implementation of IT standards that enable the electronic delivery of government services. To prevent agencies from adopting conflicting IT standards, a level of coordination is necessary.

2. Develop a priority list of relevant IT standards in the electronic delivery of government services and issue these as Federal Information Processing Standards (FIPS).

3. Monitor the compliance of agency information systems with FIPS and other relevant IT standards. This will be particularly important in IT governed by the Government Open Systems Interconnection Profile (GOSIP) requirements.

Recommendation Cluster #7:
Enhance Privacy and Security

1. Improve and extend training and education programs so that every agency employee who has access to government information understands the need for and complies with privacy and security policy practices.

2. Establish and promulgate specific government-wide guidelines on how and when to protect the privacy of individuals about whom the government maintains personal information – the New York Public Service Commission's eight-point policy statement on privacy may serve as a model.

3. Encourage the use of technologies that enhance privacy and/or security, such as multilevel-security data bases, digital and/or blind signatures, and data encryption.

4. Take active measures to ensure that electronic services that consolidate personal information, such as smartcards, preserve individual privacy.

Recommendation Cluster #8:
Streamline the Procurement Process.

1. Explore through GAO, GSA, OMB and Congress methods to streamline and the procurement process and reduce the time required to obtain and deploy IT.

2. Explore industry suggestions how the procurement process could be streamlined.

3. Explore the establishment of an ombudsman that could serve as an arbitrator in procurement disputes.

DESIGN FOR THE FUTURE

Clearly, the issues requiring attention for the Federal government to modernize its information infrastructure, to learn how to use and exploit that infrastructure, and to provide effective and innovative electronic services are significant and numerous. The decentralized nature of the Federal government's information resources management activities, the lack of coordination among agencies in their management of information resources, an out-of-date information infrastructure, and the lack of a services perspective in many agencies currently combine to inhibit the electronic provision of government services.

At the completion of our study, we obtained a copy of a November, 1992 report, Information Resources Management Plan of the Federal Government issued by the Office of Management and Budget that concluded as follows (1992a, p. III-10):

> Finally, the IRM community should work to build a Federal *service delivery* [their emphasis] infrastructure -- using information technology better to perform its missions. At root this requires new partnerships within and across agencies. Specifically, these partnerships could support: improving interagency coordination in service in service delivery; testing new citizen-service technologies such as kiosks; increasing the active dissemination of government information; reducing administrative burden and paperwork though the use of information technologies; and creating policies and incentive structures that encourage innovation.

This conclusion supports the findings and recommendations we offer in this report. We are especially pleased that OMB-OIRA plans to reshape Federal IRM into a service delivery infrastructure. But equally important is the need, *now*, for OMB-OIRA to take a leadership stance in translating this plan into tangible policies, strategies, and outcomes.

Government officials must take a leadership stance in forging agreements among key stakeholders on a vision for how the government will provide electronic services in the future. We believe that it is a citizen's right to have access to electronic information and services, that it is a reasonable expectation to be able to transact business electronically with the government, and that the government be up-to-date in its uses and applications of IT in providing services and meeting citizen needs. Additionally, the Federal government has a responsibility to "get connected" electronically and develop an initiative, such as that outlined in this Section, to provide services electronically to the public.

Most importantly, Congress must make a commitment to establishing a national electronic infrastructure that connects the government with its citizens. Until such a commitment is made, efforts to provide government services electronically are likely to be costly, duplicate, disjointed, effective only for certain select clientele groups, and of limited vision. The U.S. Federal government has both the human and technological resources to connect itself electronically to its citizens for the provision of more effective services and to improve citizens' overall quality of life. This must be accomplished if the United States is to regain the confidence of the public, leverage scarce resources, and improve the effectiveness of its many programs.

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APPENDIX A
TOPICS FOR FURTHER RESEARCH

As the investigation proceeded, the study team identified a number of research questions in key areas that will require additional attention. Those listed below are illustrative of the type of research topics requiring attention and are not a comprehensive listing.

Innovative Information Technology and Standards:

- How might information technology life cycles and information technology standards be better integrated into Federal technology and policy planning and implementation?
- What is the status of critical issues such as compatibility, integration, interconnection, and interoperability of information technologies in electronic service delivery?

Internet/NREN:

- To what degree are government agencies currently using the Internet/NREN and for what purposes?
- What barriers and successes are being encountered by agencies as they attempt to use the Internet?
- What Internet/NREN-based information services can agencies develop for
    - meeting information needs of the public (including special clientele groups)?
    - improving the government's management and use of information resources?
- What policies are needed to encourage agencies to make information and services available to other agencies and the public via the Internet/NREN?

Federal Telecommunications:

- If a chief information officer within the Federal government had available $10 billion for the acquisition of telecommunications and computer technology equipment, (a) which agency or type of service would be most deserving of such expenditures and (b) which information technologies should be chosen?
- What vision and policies are needed to enact the above concerns?
- What linkages exist or should be developed among the private sector information technology and service providers and government (at all levels)?
- What national infrastructure or intra-Federal government infrastructure is needed to derive maximum benefit from the use of information technologies?

- What can be said about the emergence of a national infrastructure, especially with regard to telecommunications and computer technologies?
- What information and telecommunications technology trends can be observed within the private sector and markets?
- What is the potential of private, competitive information and telecommunications markets?

Information Resources Management

- What can be learned from the CIM experience that has direct applicability to other agencies?
- Are there stages in the deployment of information infrastructures that are identifiable by managers and policymakers? What managerial decisions and policy actions must be taken to sustain the process?
- When seeking to affect the course of the development of new information technologies, what role can government play? What diagnostics can be derived to assist policymakers in determining the appropriateness of adopting any specific role?
- What are the characteristics of the successful manager and organization as partner? Do these characteristics vary if the partner changes from other Federal agencies, other governments, the non-profit and for-profit private sectors? What policy actions stimulate or inhibit effective organizational partnerships?
- What information does an agency negotiator need when crafting a partnership with another organization?
- What might a revised IRM curriculum geared to the provision of electronic service delivery look like?
- What are the characteristics of the successful information technology change unit? What policies and managerial practices stimulate and embed these units? What is the life cycle of these units?

State, County, and Local Governments:

- How do state, county, and local governments define constituent service?
- How do state, county, and local governments incorporate Federal mandates into their existing service frameworks? During this process, how are the mandates modified to meet state, county, and local needs?
- What lessons can the Federal government learn, if any, from state, county, and local governments about IRM policies and implementations and how they lead to efficient and effective service provision?

- How are state, county, and local governments collaborating with the private sector to provide services? What models of cooperation, if any, are discernable by types of service provided?

Privacy and Security:

- Has the existing policy framework succeeded in protecting both the privacy and the integrity of government information?
- What barriers, if any, have prevented the implementation of existing privacy and security policies?

  - Is the policy framework adequate?

  - Does the appropriate technology exist at an affordable price?

  - Are there political or other social barriers?

- What additional policy implications emerge from an expansion in the electronic delivery of government services? What changes to the current policy framework, if any, are needed?